THE

ARITHMETICIAN's GUIDE;

OR,

A Complete Exerciſe Book, &c.

THE

ARITHMETICIAN's GUIDE;

OR, A

Complete Exerciſe Book,

FOR

THE USE OF PUBLIC SCHOOLS,

AND

PRIVATE TEACHERS.

THE THIRD EDITION,

REVISED AND CORRECTED.

BY WILLIAM TAYLOR,
K
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BIRMINGHAM.

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THE

PREFACE.

EVERY community experiences the important advantages ariſing from an uſeful education of the individuals who compoſe it. He, therefore, who has any thing to offer which can promote this great object, or facilitate the means of acquiring it, has ſome claim to attention. In the following work, I flatter myſelf, it will be found, I have proceeded upon a plan which will ſhorten the time uſually ſpent in a courſe of arithmetical ſtudy, and, therefore, if I

A 3

have ſucceeded, I have done ſome ſervice both to the tutor and pupil, by rendering the taſk of education more eaſy and agreeable.

In a book of this kind, nothing ſhould be omitted which it can properly include, while great regard throughout muſt be had to the capacities of pupils, and what is moſt uſeful and common in buſineſs, principally attended to.

In compoſing, therefore, a regular treatiſe of practical arithmetic, I have endeavoured to attain the proper objects —A variety of ſuch new and uſeful queſtions as are moſt likely to occur in buſineſs, are introduced, with their anſwers annexed; and in order to render the rules ſtill more clear and familiar to the pupil, I have, where I deemed it neceſſary, given at full length, the *work* of the firſt examples in each rule, moſt of which are varied or proved by ſome other methods of work. This, though it has never been attended to by arithmetical writers, is, I am perſuaded, of the firſt importance, as it will tend ſtill more to convince the learners of the truth of the rules.

The *Arithmetician's Guide and Key*, I flatter myſelf, will be found to furniſh a ſyſtem of arithmetic ſufficiently extenſive; will enable teachers with greater eaſe to themſelves, and benefit to their ſcholars, to expedite the buſineſs of a numerous ſchool; and afford all thoſe, who are acquainted with only the firſt principles of this uſeful and neceſſary branch of learning, the means of obtaining a competent knowledge of it; and in order to make this book as uſeful as poſſible, I have added ſeveral examples of the different Forms of Acquittances, Promiſſory Notes, Bills of Exchange, Letters of Advice, Letters of Credit, &c.

I HAVE nothing further to add, but a return of my ſincere thanks to all thoſe gentlemen whoſe kind approbation and encouragement have now eſtabliſhed the uſe of this book, and favoured me with their judicious remarks.

I am,
With the utmoſt eſteem,
Their's and the Public's moſt obliged
Obedient humble ſervant,
W. TAYLOR.

BIRMINGHAM,
1798.

THE

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Characters uſed in this Work.

∴	Signifies	Ergo; or therefore.
+		Plus, or Addition.
—		Minus, or Subtraction.
×		Multiplication.
÷		Diviſion; as $9 \div 3$, is 9 divided by 3, thi ſometimes written like a fraction thus $\frac{9}{3}$.
: :: :		Proportion.
=		Equality.
√		Square Root.
∛		Cube Root.

THE
ARITHMETICIAN's GUIDE.

NUMERATION,

IS the expreſſing of any propoſed number, either by words or characters.

TABLE I.

Hundreds of millions	Tens of millions	Millions	Hundreds of thouſands	Tens of thouſands	Thouſands	Hundreds	Tens	Units
9	8	7	6	5	4	3	2	1
	9	8	7	6	5	4	3	2
		9	8	7	6	5	4	3
			9	8	7	6	5	4
				9	8	7	6	5
					9	8	7	6
						9	8	7.
							9	8
								9

TABLE II.

Periods	Quadrillions.	Trillions.	Billions.	Millions.	Units.
Half per	th. un.	th. un.	th. un.	th. un.	c.x.t.c.x.u.
Figures	345,432	615,423	689,345	214,632	324,516

EXAMPLES. (Pages 1 and 2.)

(1) Write down 1785, in words at length.
(2) Write down 324516, in words at length.
(3) Write down 615423, in words at length.
(4) Write down 7654321, in words at length.
(5) Write down 87654321, in words at length.
(6) Write down 987654321, in words at length.
(7) Write down 426784326534, in words at length.
(8) Write down 6421342103415648, in words at length.
(9) Write down 23456321436215[illegible]634, in words at length.
(10) Write down 5432642891654[illegible]465346, in words at length.
(11) Write down 86421564200046800045 62, in words at length.
(12) Write down 2146862898764842000698042, in words at length.

ADDITION,

Teacheth to add ſeveral numbers of the ſame denomination into one ſum.

EXAMPLES. (Page 2.)

(1)	(2)	(3)
2	63	423
3	45	315
4	72	531
5	81	414
3	54	612
1	18	234
4	72	621
2	63	414
3	81	711
6	72	144
3	54	621

(4) 423

(4)	(5)	(6)	(7)	(8)
423	621	126	2124	3123
342	414	216	4212	2322
234	324	162	1314	4212
423	450	450	2106	3123
540	108	360	4212	1224
612	351	414	5121	2142
234	513	216	1215	6021
405	621	621	5121	7110
630	711	513	1215	4023
216	810	324	2151	1215
522	324	414	6030	4122
324	234	720	8100	3240
801	423	603	4563	4023
423	216	234	5211	5112
612	144	801	1413	2034
108	216	126	8010	1512
846	801	243	9432	2115
135	243	162	2124	6012
243	522	450	5112	1701
513	414	342	6201	2340

(9)	(10)	(11)	(12)
4113	42102	72621	62172
1224	31050	40212	31212
2115	52101	34227	12123
3213	41121	67572	41211
4104	22023	21123	57672
5211	54423	88839	41463
6012	21015	42372	88254
1701	14121	67581	84645
2043	41211	12330	72729
4104	63432	21123	63801
5040	10215	10242	42111
1413	63126	63711	14211
8001	12042	81828	20430
1863	23400	72648	56142
2700	34011	45423	18729
1710	10413	10242	46872
2223	21231	23454	87489
3132	41130	61272	62127
1413	62424	12411	81423
2034	87315	45630	71253

APPLICATION. (Pages 2 and 3.)

Queſt. 1. What is the ſum of 34263, 53163, 8172, and 846? Anſwer, 96444.

2. Add 63, 8154, 6201, and 99 together. Anſwer, 14517.

3. How many pence are there in a crown, a half crown, a ſhilling, and a ſixpence? Anſwer, 108.

4. How many days are there from the firſt day of January, 1787, to the 30th day of April in the ſame year, both incluſive? Anſwer, 120 days.

5. Suppoſe a child was born in the year of our Lord 1787, in what year will he be ſixty years of age? Anſwer, 1847.

6. Suppoſe I leaſe a piece of land for 116 years, in the year of our Lord 1787, I deſire to know when the leaſe will expire? Anſw. In the year 1903.

SUBTRACTION,

Is the taking one ſum or number of the ſame denomination from another to find the difference.

EXAMPLES. (Page 3.)

(1)
From 86421689765
Take 12110346243
Remains 74311343522
Proof 86421689765

(2)
From 76543895621
Take 12341234510
Remains 64202661111

(3)
67898765434
21324151213

(4)
72896789678
24121304523

(5)
54321234567
21346121346

(6)
98765432148
34561234567

(7)
86596417534
23214282123

(8)
68987687687
24524518421

(9)

(9)
76543216785
41212304251

(10)
87654321076
41232101213

(11)
86432143687
31421068942

(12)
90000000000
67891234567

APPLICATION. (Page 3.)

Queſtion 1. Suppoſe a perſon born in the year of our Lord 1720, how old is he this preſent year 1787?
Anſwer, 67 years old.

2. The Royal Society was inſtituted in London in the year 1662, how long is it ſince to this preſent year 1787?
Anſw. 125 years.

3. How much is A older than B, A being born in the year 1700, and B 1746? Anſw. 46 years.

4. How much is C, whoſe age is 68, older than B, whoſe age is 29? Anſw. 39 years.

5. William the Norman conquered England in the year of our Lord 1066, how long is it ſince to this preſent year 1787? Anſw. 721 years.

6. Shakeſpear the poet died in the year of our Lord 1616, how long is it ſince to this preſent year 1787?
Anſw. 171 years.

MULTIPLICATION,

Is the multiplying any two ſums or numbers together, to find the product.

Multiplication Table.

2 times	2	is	4
	3		6
	4		8
	5		10
	6		12
	7		14
	8		16
	9		18
	10		20
	11		22
	12		24
3 times	3	is	9
	4		12
	5		15
	6		18
	7		21
	8		24
	9		27
	10		30
	11		33
	12		36
4 times	4	is	16
	5		20
	6		24
	7		28
	8		32
	9		36
	10		40
	11		44
	12		48
5 times	5	is	25
	6		30
	7		35
	8		40
	9		45
	10		50
	11		55
	12		60
6 times	6	is	36
	7		42
	8		48
	9		54
	10		60
	11		66
	12		72
7 times	7	is	49
	8		56
	9		63
	10		70
	11		77
	12		84
8 times	8	is	64
	9		72
	10		80
	11		88
	12		96
9 times	9	is	81
	10		90
	11		99
	12		108
10 times	10	is	100
	11		110
	12		120
11 times	11	is	121
	12		132
12 times	12	is	144

EXAMPLES. (Page 3.)

	(1)	(2)	(3)
Multiplicand	4243214646	3123546354	5462145612
Multiplier	2	3	4
Product	8486429292		

PAGE 4.

(4) 6372458163 × 5
(5) 2345678916 × 6
(6) 1234567809 × 7

(7) 2164235472 × 8
(8) 5481728163 × 9
(9) 6213246453 × 10

(10) 4131621045 × 11
(11) 2120462172 × 12
(12) 3124431612 × 13

RULE.—When the multiplier conſiſts of ſeveral figures, multiply the whole multiplicand by each figure in the multiplier, ſetting down the firſt figure of every line directly under the figure you are multiplying by; the ſum of all the lines is the product.

(13) 3412342629 × 23 = 78483880467
(14) 2434326246 × 36 = 87635744856
(15) 4536423432 × 45 = 204139054440

(16) 5472635481 × 54 = 295522315974
(17) 2142621333 × 63 = 134985143979
(18) 4237125372 × 72 = 305073026784

(19)

(19) 421262136
234
985753398̲24

(20) 531621702
324
172245431448

(21) 546217263
426
232688554038

PAGE 5.

(22) 728163432
368
267964142976

(23) 431162163
248
106928216424

(24) 324637254
567
184069323018

(25) 638143245
2345
1496445909525

(26) 234621423
3246
761581139058

(27) 423620172
4235
1794031428420

(28) 542034522
3674
1991434833828

(29) 621405816
32472
20178289657152

(30) 534620438
45612
24385107418056

(31) 423546372
23124
9794086306128

(32) 613854724
42354
25999202980296

PAGE 6.

(33) 123456789
324513
40063332968757

(34) 987654321
315423
311528888892783

(35) 621423234
234625
145801426277250

(36) 432324126
245674
106210797330924

(37)

(37) 235620432
4523413
1065808525174416

(38) 315728163
5423216
1712262025232208

PAGE 7.

(39) 312471423
41235678
12884970983029794

(40) 234567891
23214678
5445418058704098

(41) 478216243
123456789
59039041808423727

(42) 123456789
478216243
59039041808423727

ABBREVIATIONS.

RULE.—When cyphers are placed between the ſignifiant figures in the multiplier, omit them, and place the firſt igure in each particular product under its reſpective multiplier. When there are cyphers at the right hand of either r both the multiplier and multiplicand, proceed as before, eglecting the cyphers until the particular products are dded together, and to that ſum place the number of yphers that are at the end of both factors to the right and.

(43) 230040702
402300504
92545490355113808

(44) 630702009
203400603
128285168943911427

PAGES 8 and 9.

(45) 720203400
403020270
290256568722918000

(46) 403020270
720203400
290256568722918000

(47)

(47) 987654321
10

9876543210

(48) 19876543
100

49) 1987654
1000

(50) 198765
10000

BY PARTS.

RULE.—When the multiplier is the product of two or more numbers in the table, multiply continually by those parts, instead of the whole number at once.

(51)
Multiply 123456789
By 15

1851851835

(52)
423547281
25

10588682025

(53) 324603729
36

11685734244

(54) 637146243
56

35680189608

(55) 342635481
72

24669754632

(56) 241281243
81

19543780683

(57) 816021729
132

107714868228

(58) 456021723
144

65667128112

(59) 420480172
112

47093779264

(60) 523602432
1728

904785002496

APPLI-

APPLICATION (Pages 9 and 10.)

Queſt. 1. An army of 89460 ſoldiers having plundered a city, took ſo much that when it was divided amongſt them, each man had 50l. what was the value of the plunder? Anſwer £. 447300.

2. There are 40 men employed to complete a certain piece of work, each of which is to have 5l. what will the whole expence amount to? Anſwer £. 200.

3. What is the content of a piece of land whoſe length is 39 yards, and breadth 20 yards? Anſwer 780 yards.

4. In the field of battle there are 268 ſoldiers in rank, and 118 in file, what number of ſoldiers are in the field? Anſwer 31624 ſoldiers.

5. In a printed book there are 235 pages, 45 lines in a page, and 50 letters in a line, how many did it take to compoſe the book? Anſwer 528750 letters.

6. In a certain town there are 10000 houſes, and in every houſe 5 perſons, how many perſons are in the town? Anſwer 50000 perſons.

7. What number taken from the ſquare of 50 will leave 20 times 100? Anſwer 500.

DIVISION,

IS the dividing of any given number into any propoſed number of equal parts.

EXAMPLES (Page 10).

(1) Dividend
Diviſor 2)8486429292
Quotient 4243214646

(2)
3)9370639062
3123546354

(3)
4)21848582448

(4)
5)31862290815

(5)
6)14074073676

(6)
7)8641974663

(7)
8)17313883776

(8)
9)49335553467

(9)
10)62132464530

(10)
11)45447831495

(11)
12)25445546064

PAGES

PAGES 11, 12, 13, 14, 15, 16, 17, and 18.

```
           (12)                                  (13)
13)40617610956(3124431612          23)78483880467(3412342629
   39                                 69
   --                                 --
   .16                                .94
    13                                 92
    --                                 --
    .31                                .28
     26                                 23
     --                                 --
     .57                                .53
      52                                 46
      --                                 --
      .56                                .78
       52                                 69
       --                                 --
       .41                                .98
        39                                 92
        --                                 --
        .20                                .60
         13                                 46
         --                                 --
         .79                                144
          78                                138
          --                                ---
          .15                               ..66
           13                                 46
           --                                 --
           .26                                .207
            26                                 207
            --                                 ---
```

```
        (14)                          (15)
36)87635744856(               45)204139054440(
        (16)                          (17)
54)295522315974(              63)134985143979(
        (18)                          (19)
72)305073026784(              234)98575339824(
        (20)                          (21)
324)172245431448(             426)232688554038(
        (22)                          (23)
368)267964142976(             248)106928216424(
        (24)                          (25)
567)184069323018(             2345)1496445909525(
        (26)                          (27)
3246)761581139058(            4235)1794031428420(
        (28)                          (29)
3674)1991434833828(           32472)20178289657152(
                                                      (30)
```

(30)
45612)24385107418056(

(31)
23124)97940863306128(

(32)
42354)25999202980296(

(33)
324513)40063332968757(

(34)
315423)31152888888927783(

(35)
234625)14580142627725o(

(36)
245674)10621079733o924(

(37)
4523413)106580852517441б(

(38)
5423216)17122620252322208(

(39)
41235678)12884970983029794(

(40)
23214678)54454180587040098(

(41)
123456789)59039041808423727(

(42)
478216243)59039041808423727(

ABBREVIATIONS.

RULE.—When the Diviſor has cyphers on the right of it, you may ſtrike them off and divide without them; but the ſame number of figures muſt be ſtruck off from the right of the dividend, and affixed to the laſt remainder.

PAGES 19 and 20.

(43)
402300504)92545490355113808(

(44)
203400603)128285168943911427(

(45)
403020270)290256568722918000(

(46)
720203400)290256568722918000(

(47)
10)9876543210(

(48)
100)1987654300(

(49)
1000)1987654000(

(50)
10000)1987650000(

BY PARTS.

RULE.—When the diviſor is the product of two or more numbers in the table, divide continually by thoſe numbers, inſtead of the whole diviſor.

If there be any remainders after ſuch diviſions, multiply the laſt remainder by the preceding diviſor, and to the product add the preceding remainder, multiply this ſum by the next preceding diviſor, and to the product add the next preceding remainder, and ſo on till you have gone through all the diviſors and remainders to the firſt, which will be the true remainder.

(51)
Divide 1851851835 by 15

15 { 3)1851851835
5) 617283945
123456789

(52)
Divide 10588682025 by 25

(53)
Divide 11685734244 by 36

(55)
Divide 24669754632 by 72

(57)
Divide 107714868228 by 132

(59)
Divide 47093779264 by 112

(54)
Divide 35680189608 by 56

(56)
Divide 19543780683 by 81

(58)
Divide 65667128112 by 144

(60)
Divide 904785002496 by 1728

APPLICATION. (Page 21.)

Queſt, 1. An army of 89460 men having plundered a city, took 4473000l. what was each man's ſhare? Anſw. 50l.

2. A gentleman agreed to give 200l. for a certain piece of work; now if 40 men are employed, what is each man's ſhare? Anſw. 5l.

3. Suppoſe I leaſe 780 ſquare yards of land to build upon, the front of which is twenty yards, how many yards in depth muſt be fenced out to make up the exact compliment of ſquare yards? Anſw. 39 yards.

4. A General hath 31624 ſoldiers in the field; now ſuppoſe he placeth 268 in the rank, how many will there be in the file. Anſw. 118 men.

5. In a printed book there are 528750 letters, each line of which contains 50 letters, and each page 45 lines; how many pages are there in the book? Anſwer, 235.

6. In a certain town there are 50,000 perſons, and every houſe on an average contains five perſons; how many houſes are there in the town? Anſwer, 10,000.

7. What number added to 20 times 100, will give the ſquare of 50? Anſwer, 500.

COMPOUND ADDITION,

IS the adding ſeveral ſums or numbers together, having divers denominations.

ARITHMETICAL TABLES.

PENCE TABLES.

s.		*d.*	
1	is	12	
2	—	24	
3	—	36	
4	—	48	
5	—	60	
6	—	72	
7	—	84	
8	—	96	
9	—	108	
10	—	120	
11	—	132	
12	—	144	
13	—	156	
14	—	168	
15	—	180	
16	—	192	
17	—	204	Piſtole
18	—	216	
19	—	228	
20	—	240	Pound
21	—	252	Guinea
27	—	324	Moidore

d.		*s.*	*d.*	
20	is	1	8	
30	—	2	6	Half a crown
40	—	3	4	
50	—	4	2	
60	—	5	0	Crown
70	—	5	10	
80	—	6	8	Noble
90	—	7	6	
100	—	8	4	
110	—	9	2	
120	—	10	0	Angel
130	—	10	10	
140	—	11	8	
150	—	12	6	
160	—	13	4	Mark
170	—	14	2	
180	—	15	0	
190	—	15	10	
200	—	16	8	
210	—	17	6	
220	—	18	4	
240	—	20	0	Pound

4 farthings make	1 penny	*d.*	$\frac{1}{4}$	is wrote for	1 qr.
12 pence -	1 ſhilling	*s.*	$\frac{1}{2}$		2 qrs.
20 ſhillings -	1 pound	*l.*	$\frac{3}{4}$		3 qrs.

TROY WEIGHT.

24 grains *gr.* make 1 pennyweight, *dwt.*
20 pennyweights 1 ounce, *oz.*
12 ounces 1 pound, *lb.*

AVOIRDUPOISE WEIGHT.

16 drams *dr.* make 1 ounce *oz.*
16 ounces 1 pound *lb.*
28 pounds 1 quar. of cwt. *qr.*
4 quarters 1 hundred, *cwt.*
20 hundred 1 ton, *T.*
14 pounds 1 ſtone
4 ſtone 1 truſs of old hay
8 pounds of butcher's meat 1 ſtone
19½ hundreds 1 fother of lead

APOTHECARIES WEIGHT.

20 grains *grs.* make 1 ſcruple, ℈
3 ſcruples 1 dram, ʒ
8 drams 1 ounce, ℥
12 ounces 1 pound, ℔.

WOOL WEIGHT.

7 pounds make 1 clove
2 cloves 1 ſtone
2 ſtones 1 todd
6½ todds 1 wey
2 weys 1 ſack
12 ſacks 1 laſt
7 todds in ſome places make one wey, and 240 pounds one pack.

CLOTH MEASURE.

2¼ inches make 1 nail
4 nails 1 quarter of a yard
3 quarters 1 ell Flemiſh
4 quarters 1 yard
5 quarters 1 ell Engliſh
6 quarters 1 ell French.

LAND MEASURE.

7 inches 92 parts make 1 link
25 links 1 pole
5½ yards 1 perch, rod, or pole
40 poles 1 rood
4 roods 1 acre
30 acres 1 yard of land
100 acres 1 hide of land.

WINE MEASURE.

4 gills make 1 pint
2 pints 1 quart
2 quarts 1 pottle
4 quarts 1 gallon
10 gallons 1 anker of brandy or rum
18 gallons 1 runlet
31½ gallons 1 barrel
42 gallons 1 tierce
2 tierce 1 puncheon
63 gallons 1 hogſhead
2 hogſheads 1 pipe or butt
2 pipes, 252 gallons 1 ton.

LONG MEASURE.

3 barley corns, *b. c.* make 1 inch, *in.*
12 inches 1 foot, *f.*
3 feet 1 yard, *yd.*
5 feet 1 pace
2 yards 1 fathom
5½ yards 1 pole, rod, or perch
22 yards 4 poles
4 poles, or 100 links 1 chain
40 poles, or 10 chains 1 furlong
8 furlongs, or 1760 yards 1 mile
3 miles 1 league
23⅛ leagues, or 69½ miles 1 degree
360 degrees 1 circumference

4 inches 1 hand
9 inches 1 ſpan
2 ſpans 1 cubit
2 cubits 1 yard
2030 yards 1 geographical mile
1 French toiſe 6 French feet
18 Engliſh feet 1 pole in the fens
21 feet 1 pole in the foreſt.

ALE & BEER MEASURE.

2 pints make 1 quart
4 quarts 1 gallon
8 gallons 1 firkin of ale
9 gallons 1 firkin of beer
2 firkins or 16 gals. 1 kilderkin, or half barrel of ale
2 firkins or 18 gals. 1 kilderkin, or half barrel of beer
32 gallons 1 barrel of ale
36 gallons 1 barrel of beer
48 gallons 1 hogſhead of ale
54 gallons 1 hogſhead of beer
2 Hhds. or 96 gallons 1 butt of ale
2 Hhds. or 100 gallons 1 butt of beer.

Note. This difference betwixt ale and beer meaſure, is now only uſed in London; but in all other places in England the general ſtandard table of *beer* and *ale*, whether it be ſtrong or ſmall, is to be obſerved according to a ſtatute of exciſe made in the year 1689, for gauging and ſelling

General Standard in the Country.

282 cubic inches 1 gallon
8½ gallons 1 firkin
17 gallons 1 kilderkin
34 gallons 1 barrel
51 gallons 1 hhd. of beer or ale.

Note. Common brewers in the country allow 36 gallons to the publicans for a barrel of beer or ale.

DRY MEASURE.

2 pints make 1 quart
2 quarts 1 pottle
2 pottles or 8 pints 1 gallon
2 gallons or 16 pints 1 peck
4 pecks 1 buſhel
4 buſhels 1 comb
2 combs or 8 buſhels 1 quarter or ſeam
5 quarters or 40 buſhels 1 load
2 loads 1 wey
12 weys 1 laſt.

For Coals.

4 pecks 1 buſhel
3 buſhels 1 ſack
9 buſhels 1 quarter of a chaldron
4 quarters, or 36 buſhels 1 chaldron
21 chaldrons 1 ſcore of coals.

Alſo,

4 quarters, or 32 buſhels make 1 chaldron in the country
5 pecks 1 buſhel water meaſure
5 buſhels 1 ſack of flour.

TIME.

60 thirds make 1 ſecond
60 ſeconds 1 minute
60 minutes 1 hour

24 hours 1 day
7 days 1 week
4 weeks 1 month
13 months, 1 day, 6 hours, 1 Julian year
365 days, 5 hours, 48 min. 55 ſec. 1 ſolar year.

MOTION.

60 ſeconds″ make 1 minute
60 minutes 1 degree°
30 degrees 1 ſign
12 ſigns, or 360 degrees, 1 great circle of the zodiac.

SQUARE MEASURE.

144 inches make 1 foot
9 feet 1 yard
272¼ feet 1 rod of brick-work
30¼ yards 1 pole
16 poles 1 chain
40 poles 1 rood
10 chains 1 acre
4 roods 1 acre
160 poles 1 acre
4840 yards 1 acre
640 acres 1 mile.

SOLID MEASURE.

1728 inches make 1 foot
27 feet 1 yard or load
40 feet of unhewn timber 1 ton or load
50 feet of hewn timber 1 ton or load
231 inches 1 wine gallon
282 inches 1 ale or beer gallon.
268⅔ inches 1 corn gallon
215042 inches 1 ſtandard buſhel.

HEBREW COIN.

A ſilver menah (weight ſixty ſhekels) 7l. 1s. 5¼d.
Talent of ſilver (weight 300 ſhekels) 357l. 11s. 10½d.
Talent of gold (ſame weight) 5075l. 15s. 7½d.
Gold dram (mentioned Ezek. ii. 19) 1l. 0s. 4d.

EXAMPLES of MONEY. (Page 22.)

(1)

£.	s.	d.
23	6	8¼
42	4	2
51	2	6½
18	5	3
41	8	7½
36	7	4
58	9	3¼
22	6	2
31	2	6¼

(2)

£.	s.	d.
41	12	4½
32	10	6
61	13	8¼
12	10	6
18	12	8¾
48	16	2
21	14	3¼
64	19	6
51	10	3¾

(3)

	£.	s.	d.
(3)	436	12	4¾
	214	10	2
	421	12	3
	604	13	6
	346	14	8½
	123	16	6
	531	10	4¼
	678	12	8
	210	10	7
	142	12	6¼
	234	13	4
	346	14	3¼
	214	15	6
	761	12	4
	421	16	6½
	500	10	0
	231	11	3
	364	14	8¼
	235	12	4
	642	18	8¾

	£.	s.	d.
(4)	326	10	6½
	123	12	3
	210	14	8
	102	12	4½
	412	16	8
	345	18	2
	684	10	3¼
	412	12	4
	123	16	2
	216	10	0
	168	14	4
	213	16	4
	486	12	2
	100	0	4½
	516	10	2
	874	18	3
	141	16	1¼
	142	11	2
	510	15	5
	345	12	4½

	£.	s.	d.
(5)	123	10	6
	401	12	2
	345	13	4¼
	148	10	1
	400	10	0
	345	16	4
	510	11	6
	601	10	4½
	12	12	6
	100	16	4
	231	14	8
	364	18	6½
	340	12	2
	104	14	3
	421	18	9
	602	11	0¼
	708	14	1
	164	12	2
	314	10	3
	231	18	6¼

	£.	s.	d.
(6)	486	13	4½
	214	12	3
	123	14	8
	231	11	8
	414	10	2¼
	324	10	4
	678	18	8
	421	16	6
	204	12	4½
	542	16	6
	607	17	6
	142	12	7½
	241	10	2
	672	13	3
	214	18	9
	631	16	0¼
	123	11	1
	200	18	2
	425	15	6
	310	19	8½

	£.	s.	d.
(7)	345	16	4¼
	221	13	3
	412	12	1½
	121	13	1
	234	11	6¼
	121	3	2
	241	14	1¾
	312	12	2
	641	11	3½
	113	12	1
	221	16	2¼
	412	12	1
	532	8	4¼
	641	12	2
	212	13	8¼
	141	11	4
	421	12	3½
	215	13	1
	326	17	3¾
	913	12	2¼

	£.	s.	d.
(8)	467	16	2¼
	122	13	4
	141	12	2½
	246	7	1
	152	11	3¾
	361	12	2
	121	11	4½
	214	11	6
	303	12	2¼
	417	12	1
	521	8	8¾
	601	11	1
	134	16	7¼
	145	12	2
	216	13	1¼
	313	14	3
	427	11	2
	452	12	4½
	236	15	6
	423	14	2½

	£.	s.	d.
(9)	546	12	4¼
	421	12	2
	132	13	1½
	274	12	2
	311	14	3¾
	114	11	4
	240	4	2½
	413	16	1
	540	11	5¼
	124	12	3
	312	15	4¼
	130	12	1
	456	6	1¼
	622	12	2
	214	18	1½
	130	11	8
	312	12	1¾
	160	14	7
	321	12	1½
	213	14	1

	£.	s.	d.
(10)	346	12	4½
	212	13	2
	401	11	1¾
	630	13	2¼
	147	8	1¾
	122	12	4
	232	12	3¼
	414	14	1¾
	103	12	8
	368	10	4½
	431	6	6½
	207	15	1
	140	14	4¼
	243	18	2
	616	14	2¾
	472	10	6½
	204	10	2
	212	14	1¼
	161	13	7
	342	12	2¾

	£.	s.	d.
(11)	238	13	3¼
	121	14	2
	149	12	1½
	220	10	2
	314	6	1¼
	621	12	4
	143	11	1¾
	201	10	4
	406	10	6¼
	242	14	2
	314	12	1¼
	726	3	7
	120	10	2¾
	160	10	8
	804	11	1¼
	125	14	9
	543	11	6¼
	412	12	3¾
	612	10	5
	342	11	4¼

	£.	s.	d.
(12)	146	12	4¼
	310	16	2
	426	12	4
	500	18	6
	294	19	9¼
	567	18	8
	890	17	2
	123	14	4
	456	15	1½
	789	10	0
	100	10	1
	234	11	2
	356	12	3¼
	780	13	6
	918	12	4
	765	14	5
	204	15	6½
	310	12	7
	617	17	6
	123	12	3¼

TROY WEIGHT.

	lb.	*oz.*	*dwt.*	*gr.*
(13)	45	8	12	20
	11	4	14	7
	43	2	10	3
	21	1	16	4
	8	3	2	2
	14	4	1	14
	21	1	10	3
	11	10	2	1
	34	4	3	8
	12	5	2	10
	44	3	12	6
	34	10	3	12
	21	3	12	17
	2	2	8	1
	14	1	1	5
	43	2	6	4
	1	4	10	12
	44	10	1	10
	33	1	4	3
	23	3	6	2

	lb.	*oz.*	*dwt.*	*gr.*
(14)	45	6	10	18
	13	2	8	4
	22	1	1	3
	0	4	3	1
	21	2	5	4
	32	3	6	6
	21	10	2	1
	1	3	10	4
	23	5	3	4
	45	2	6	10
	21	1	10	3
	35	2	4	5
	4	1	3	16
	35	3	1	2
	16	10	4	3
	21	4	1	10
	11	2	3	10
	5	10	1	2
	12	0	6	6
	24	1	3	5

APOTHECARIES WEIGHT.

	lb.	*oz.*	*dr.*	*ſc.*	*gr.*
5)	2	10	7	2	16
	4	3	2	1	2
	1	2	1	1	4
	0	1	3	2	10
	3	2	2	1	3
	2	4	1	1	1
	3	10	2	1	15
	1	3	5	2	2
	6	4	4	1	4
	3	6	2	2	6
	1	11	3	1	14
	1	1	4	2	3
	2	4	5	1	4
	7	2	4	1	6
	2	6	3	2	4
	1	10	2	1	10
	8	2	1	1	3
	6	4	3	2	5
	1	3	5	1	3
	6	2	4	1	2

	lb.	*oz.*	*dr.*	*ſc.*	*gr.*
(16)	5	8	6	2	17
	3	1	1	1	1
	4	10	2	1	6
	4	3	4	2	2
	3	2	1	1	1
	5	1	2	1	16
	6	2	2	1	2
	0	10	3	2	11
	6	3	4	1	2
	4	5	2	2	2
	2	10	1	1	3
	3	2	6	2	5
	0	1	1	1	3
	3	5	1	1	1
	2	6	4	2	14
	7	10	1	1	3
	2	1	2	2	10
	2	4	1	1	6
	5	5	4	1	12
	2	1	6	1	18

AVOIRDUPOISE WEIGHT.

(Page 23)

	T.	*C.*	*qr.*	*lb.*	*oz.*	*dr.*
(17)	6	16	3	26	12	13
	4	2	2	1	6	5
	6	3	1	4	4	6
	2	10	1	10	8	10
	3	5	2	2	2	2
	1	1	3	1	1	12
	5	2	3	4	4	3
	4	4	2	6	8	4
	2	2	1	16	7	7
	3	10	2	11	2	1
	1	16	1	10	6	6
	2	4	1	2	7	1
	3	6	1	3	5	2
	2	4	2	4	1	4
	1	14	1	6	10	3
	3	2	1	2	12	2
	6	6	3	1	3	8
	4	2	2	4	4	1
	3	4	1	2	2	6
	2	3	3	2	4	3

	T.	*C.*	*qr.*	*lb.*	*oz.*	*dr:*
(18)	4	16	3	21	14	12
	5	3	1	6	3	4
	6	8	2	12	4	2
	3	15	1	10	2	11
	7	2	2	8	1	12
	1	4	1	6	1	3
	1	2	2	7	2	4
	4	4	1	1	1	2
	2	1	2	2	8	4
	3	10	3	6	7	13
	7	4	1	2	1	2
	2	2	2	5	1	2
	8	4	1	4	4	4
	1	5	2	4	3	5
	3	2	3	2	2	1
	1	6	1	3	4	10
	1	2	2	8	5	8
	4	3	1	1	6	10
	5	4	3	4	1	5
	4	2	2	5	2	3

CLOTH MEASURE.

	Yds.	*qr.*	*na.*
(19)	24	3	2
	13	1	3
	24	2	1
	12	1	2
	33	1	1
	42	1	2
	16	2	1
	42	3	1
	51	2	2
	18	1	1
	24	1	2
	16	1	1
	1	3	3
	87	2	1
	14	1	2
	72	2	1
	23	1	1
	4	2	3
	54	3	3
	42	3	3

	E. Ells.	*qr.*	*na.*
(20)	35	3	3
	24	4	1
	16	2	1
	40	1	1
	52	2	2
	21	1	1
	47	2	2
	61	2	1
	4	1	1
	16	4	2
	44	1	2
	21	3	1
	22	1	2
	3	1	1
	65	3	1
	12	4	2
	38	1	0
	42	3	1
	14	4	1
	35	2	1

	F. Ells.	*qr.*	*na.*
(21)	45	2	3
	21	1	1
	23	0	1
	14	1	1
	26	2	2
	31	0	1
	42	1	0
	30	1	2
	46	0	1
	87	2	3
	10	1	1
	72	1	0
	1	0	3
	80	1	0
	47	2	3
	61	1	1
	40	0	2
	36	1	3
	55	1	0
	42	0	2

LONG MEASURE.

(Page 23)

	Leag.	*mi.*	*fur.*	*po.*
(22)	14	2	6	36
	21	1	1	8
	43	1	1	1
	21	0	1	27
	60	1	4	4
	21	2	3	5
	12	0	2	31
	71	1	5	23
	2	1	1	8
	20	0	2	1
	43	0	1	24
	24	1	3	21
	12	2	1	6
	21	0	2	21
	52	1	4	8
	30	2	5	10
	15	1	0	36
	60	1	1	8
	21	0	0	4
	13	1	2	15

	Yds.	*ft.*	*in.*	*b.c.*
(23)	41	2	8	2
	14	1	1	1
	31	0	4	0
	42	1	1	1
	61	2	2	2
	43	1	1	1
	4	1	1	0
	12	0	6	1
	4	1	3	1
	12	1	7	0
	22	0	2	1
	21	2	6	2
	65	1	2	0
	13	0	1	1
	46	1	4	1
	63	0	5	2
	51	1	3	0
	34	0	1	1
	81	2	2	0
	24	1	3	1

LAND MEASURE.

	A.	*R.*	*P.*
(24)	45	3	18
	34	2	27
	16	1	8
	12	1	4
	61	1	6
	20	1	27
	14	0	4
	40	2	5
	21	1	32
	13	0	4
	31	1	6
	60	0	3
	21	3	20
	43	1	6
	30	3	20
	12	0	31
	10	1	3
	61	0	1
	20	2	23
	12	2	4

	A.	*R.*	*P.*
(25)	56	2	36
	12	1	8
	31	0	10
	45	1	4
	54	2	3
	68	1	20
	21	2	6
	17	1	3
	2	0	30
	41	3	4
	13	2	11
	43	1	8
	1	2	4
	31	3	6
	16	0	27
	23	1	8
	4	2	4
	35	0	6
	64	2	21
	35	1	6

	A.	*R.*	*P.*
(26)	23	1	20
	31	2	31
	12	3	3
	31	1	4
	2	2	5
	47	1	34
	22	0	2
	30	2	12
	48	1	3
	20	1	8
	31	3	4
	14	1	24
	31	1	4
	23	2	8
	31	1	21
	44	0	3
	31	1	21
	76	2	4
	48	1	8
	89	3	16

WINE MEASURE.

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(27)

T.	*hhd.*	*gal.*	*qt.*	*pi.*
4	3	45	3	1
1	1	6	1	0
2	2	2	2	1
2	3	4	2	1
6	1	24	1	0
7	1	6	0	1
8	2	3	1	1
1	0	42	2	1
4	1	4	0	0
2	2	6	3	0
7	0	2	2	1
8	2	12	1	1
6	0	23	3	1
1	1	4	0	1
7	2	6	2	1
4	1	30	1	1
2	1	4	3	1
6	0	8	3	0
7	2	21	3	1
4	2	36	3	1

(28)

T.	*hhd.*	*gal.*	*qt.*	*pi.*
6	2	36	3	1
4	1	4	1	0
1	1	5	0	1
1	2	31	2	1
5	3	5	1	0
9	0	6	2	1
1	1	21	3	0
3	2	41	1	1
1	3	3	2	0
8	1	4	1	1
7	2	2	2	1
6	0	1	1	0
1	1	2	0	1
6	1	10	1	0
9	1	41	2	1
7	2	22	0	1
1	1	8	1	0
4	0	10	2	1
3	1	41	0	0
5	2	4	2	1

ALE AND BEER MEASURE.

(29)

A. hhd.	*gal.*	*qt.*	*pi.*
23	27	3	1
62	6	1	0
21	3	2	1
53	24	0	1
41	3	1	0
32	7	2	1
71	20	1	1
31	40	2	0
12	2	1	1
21	5	3	1
31	34	2	0
13	6	1	1
21	2	0	0
12	10	2	1
30	7	1	1
11	2	0	1
20	21	2	0
61	6	1	1
10	31	0	0
1	5	2	1

(30)

B. hhd.	*gal.*	*qt.*	*pi.*
23	23	3	1
11	4	1	1
21	36	0	0
12	6	2	1
51	3	1	0
11	40	2	1
42	5	1	1
31	30	0	0
41	6	3	1
52	27	2	1
23	8	1	1
10	4	2	1
41	26	0	0
32	4	3	0
41	3	1	1
71	40	0	1
0	4	1	0
61	20	2	1
21	31	1	0
12	22	1	1

DRY MEASURE.

(Page 23)

	L.	*qr.*	*bu.*	*pec.*	*gal.*
(31)	4	8	6	3	1
	2	7	5	2	0
	3	6	4	1	1
	5	5	3	0	1
	7	4	2	1	0
	1	3	1	2	1
	6	2	2	3	0
	8	1	0	0	1
	3	0	3	1	0
	2	2	1	2	1
	1	3	4	1	1
	7	5	2	0	0
	9	4	4	1	1
	1	7	3	2	1
	2	0	5	0	0
	4	1	6	1	1
	3	4	1	3	0
	2	2	0	2	0
	6	1	4	0	1
	3	4	2	2	1

	L.	*qr.*	*bu.*	*pec.*	*gal.*
(32)	8	7	6	3	1
	7	6	5	2	0
	6	5	4	1	1
	5	4	3	0	1
	4	3	2	3	1
	3	2	1	2	0
	2	1	6	1	1
	1	0	5	0	1
	9	1	4	3	1
	8	2	3	2	0
	7	1	2	1	1
	2	0	1	1	0
	6	2	0	0	1
	5	3	2	1	0
	4	4	3	2	1
	3	2	1	2	1
	2	5	4	3	0
	1	3	2	2	1
	2	6	5	2	0
	3	4	4	1	1

TIME.

	Years	*mo.*	*w.*	*days.*
(33)	23	9	3	6
	46	8	2	5
	84	7	1	4
	72	6	0	3
	13	5	3	2
	20	4	2	1
	84	3	1	0
	16	2	0	5
	41	1	1	4
	23	0	1	3
	64	9	2	2
	12	8	2	1
	21	7	3	0
	14	5	3	4
	36	6	1	3
	74	4	2	2
	17	2	3	1
	63	3	0	2
	42	1	1	3
	21	6	2	4

	Days.	*ho.*	*mi.*	*ſec.*
(34)	46	9	54	48
	33	8	3	6
	21	7	12	5
	62	6	10	4
	74	5	4	37
	12	4	6	3
	31	3	7	2
	10	2	1	1
	42	1	14	26
	37	0	21	2
	62	9	3	3
	74	8	4	4
	13	7	21	5
	47	0	2	6
	62	6	4	27
	31	5	6	5
	89	1	8	4
	61	4	29	2
	20	3	2	6
	45	2	12	13

MOTION.

(Page 23)

	·	°	′	″	‴
(35)	9	4	21	46	21
	8	5	3	7	2
	7	6	4	8	3
	6	7	5	9	4
	5	8	6	22	5
	4	9	31	3	32
	3	8	2	4	3
	2	7	3	5	4
	1	2	4	6	5
	9	6	5	18	6
	8	5	42	7	43
	7	4	3	6	7
	6	3	4	5	8
	5	2	5	4	9
	4	1	6	2	10
	3	2	12	1	4
	2	3	7	6	3
	8	4	4	7	2
	4	5	2	4	21
	3	6	5	3	6

	ſ.	°	′	″	‴
(36)	8	27	48	22	34
	7	6	7	3	5
	5	5	6	4	6
	6	4	5	2	7
	5	3	4	6	8
	4	1	3	7	9
	3	11	2	5	1
	2	3	41	4	2
	1	4	4	36	3
	6	5	5	7	26
	7	21	6	1	7
	5	4	7	2	2
	4	5	1	3	1
	3	6	4	4	3
	1	7	21	6	4
	2	1	4	7	6
	4	21	2	32	7
	6	6	1	8	2
	7	3	12	7	4
	4	5	6	4	5

SQUARE MEASURE.

	Yds.	*ft.*	*inch.*
(37)	42	8	12
	21	7	23
	32	6	34
	43	5	56
	54	4	78
	65	3	90
	76	2	12
	87	1	48
	98	2	57
	19	3	66
	28	4	75
	37	5	84
	45	6	10
	56	7	3
	64	4	14
	73	2	20
	82	1	16
	91	3	73
	23	4	21
	46	5	42

	Yds.	*ft.*	*inch.*
(38)	36	7	21
	45	6	34
	54	5	21
	63	4	56
	72	3	78
	81	2	90
	92	1	12
	13	0	11
	24	2	13
	35	3	24
	46	4	57
	57	5	61
	68	6	21
	79	7	10
	81	8	42
	10	9	63
	21	1	74
	32	2	81
	43	3	2
	54	4	53

SOLID MEASURE.

(Page 23)

	Yds.	ft.	inch.
(39)	45	9	87
	64	8	31
	42	7	45
	31	6	32
	14	5	14
	20	4	21
	31	3	36
	74	2	42
	41	1	10
	45	6	2
	76	5	31
	81	7	45
	17	4	67
	41	3	84
	32	2	12
	10	4	41
	56	7	32
	74	1	56
	12	4	71
	46	3	12

	Yds.	ft.	inch.
(40)	56	9	34
	78	7	56
	90	8	78
	12	4	19
	34	5	28
	56	6	76
	78	1	54
	90	2	32
	12	3	10
	23	4	1
	45	5	23
	67	6	45
	89	7	67
	10	8	81
	21	9	20
	30	1	34
	45	2	25
	67	3	10
	41	4	24
	23	5	32

APPLICATION. (Page 24.)

Queſt. 1. A Tradeſman received in caſh of A. 27l 1s 4d, of B. 12l 6s 8½d, of C. 31l 12s 8d, of D. 42l 14s 8¼d, of E. 82l 4s 2d, and F. 41l 16s 3½d, what was the ſum received? Anſw. £237 15 10¼

2. A Cornfactor pays for wheat 23l 12s 6d, for rye 16l 4s 2d, for oats 20l 0s 6d, for barley 38l 14s 6½d, he alſo paid for carriage 1l 6s, now ſuppoſe his commiſſion on the whole is 3l 10s 6d, how much muſt he draw for upon his employer to clear the account? Anſw. £103 8 2½

3. A. owes ſuch a ſum of money, that if he paid thirty pounds ten ſhillings and ſix-pence; the remainder to pay will be forty-two pounds two ſhillings and four-pence; required the ſum owed? Anſw. £72 12 10

4. A privateer took a prize, the private men's ſhare came to 394l 12s 6d, the officers received as much, beſides 240l unknown to the private men; how much did the officers receive? Anſw. £634 12 6

5. Bought a parcel of goods, whereof the firſt coſt was 58l, paid for packing them half a guinea, for carriage a moidore, and ſpent about the bargain a noble; what do theſe goods ſtand me in? Anſw. £60 4 2

6. If the yearly rent of my houſe is 30l per annum, window lights 18s 10½d, poor's rates 10l, lamp and ſcavenger's levy two guineas, how much does the whole amount to per annum? Anſw. £43 0 10½

COMPOUND SUBTRACTION,

Teacheth to find the difference between any two ſums of divers denominations.

EXAMPLES of MONEY. (Page 24.)

(1)	£.	s.	d.
From	86	18	6¾
Take	63	12	4½
Remains	23	6	2¼
Proof	86	18	6¾

(2)	£.	s.	d.
	79	16	8¼
	62	10	4¾

(3)	£.	s.	d.
	56	19	9½
	41	12	4

(4)	£.	s.	d.
	43	10	4
	21	18	6¾

(5)	£.	s.	d.
	87	19	8¼
	46	10	4½

(6)	£.	s.	d.
	39	18	7¾
	21	16	8¼

(7)	£.	s.	d.
	47	10	2¼
	29	12	4

(8)	£.	s.	d.
	68	16	8¼
	41	18	2¼

TROY WEIGHT.

(Page 25)

(9)	lb.	oz.	dwt.	gr.
	86	10	18	21
	14	8	9	12

(10)	lb.	oz.	dwt.	gr.
	67	9	16	18
	21	6	9	14

(11)

	lb.	*oz.*	*dwt*	*gr.*
(11)	87	6	9	14
	12	8	12	10

	lb.	*oz.*	*dwt.*	*gr.*
(12)	86	10	10	21
	13	8	18	12

APOTHECARIES WEIGHT.

	lb.	*oz.*	*dr.*	*ſc.*	*gr.*
(13)	86	10	7	2	18
	31	9	4	1	12

	lb.	*oz.*	*dr.*	*ſc.*	*gr.*
(14)	56	9	6	2	15
	37	4	2	1	12

	lb.	*oz.*	*dr.*	*ſc.*	*gr.*
(15)	98	10	2	2	16
	56	8	6	1	14

	lb.	*oz.*	*dr.*	*ſc.*	*gr.*
(16)	61	11	7	1	10
	46	6	3	2	18

AVOIRDUPOISE WEIGHT.

	T.	*C.*	*qr.*	*lb.*	*oz.*	*dr.*
(17)	8	18	3	21	14	15
	4	12	2	18	12	11

	T.	*C.*	*qr.*	*lb.*	*oz.*	*dr.*
(18)	9	16	1	21	12	8
	5	18	3	16	11	4

	T.	*C.*	*qr.*	*lb.*	*oz.*	*dr.*
(19)	9	19	1	11	12	13
	1	14	3	26	14	15

	T.	*C.*	*qr.*	*lb.*	*oz.*	*dr.*
(20)	10	0	0	0	0	0
	6	14	2	12	10	10

CLOTH MEASURE.

	Yds.	*qu.*	*na.*
(21)	56	3	3
	23	1	2

	E.E.	*qr.*	*na.*
(22)	78	4	1
	45	2	3

	F.E.	*qr.*	*na.*
(23)	67	2	0
	38	1	3

	Yds.	*qr.*	*na.*
(24)	76	3	0
	51	0	3

	E.E.	*qr.*	*na.*
(25)	32	4	1
	17	3	3

	F.E.	*qr.*	*na.*
(26)	43	2	1
	40	1	3

LONG MEASURE.

	Leag.	*mi.*	*fur.*	*po.*
(27)	78	2	7	36
	34	1	5	21

	Yds.	*ft.*	*in.*	*b.c.*
(28)	89	2	10	2
	56	1	8	1

	Leag.	*mi.*	*fur.*	*po.*
(29)	43	0	6	26
	23	2	5	12

	Yds.	*ft.*	*in.*	*b.c.*
(30)	90	0	0	1
	42	2	10	2

LAND MEASURE.

	A.	*R.*	*P.*
(31)	78	3	38
	12	1	21

	A.	*R.*	*P.*
(32)	61	3	37
	34	1	26

	A.	*R.*	*P.*
(33)	54	2	21
	24	3	39

	A.	*R.*	*P.*
(34)	39	0	6
	18	3	18

	A.	*R.*	*P.*
(35)	65	2	10
	46	3	39

	A.	*R.*	*P.*
(36)	98	0	0
	21	3	39

WINE MEASURE.

	T.	*hhd.*	*gal.*	*qt.*	*pi.*
(37)	5	3	61	3	1
	2	1	32	1	0

	T.	*hhd.*	*gal.*	*qt.*	*pi.*
(38)	6	3	49	3	1
	2	1	36	2	0

	T.	*hhd.*	*gal.*	*qt.*	*pi.*
(39)	7	0	39	1	0
	4	2	26	3	1

	T.	*hhd.*	*gal.*	*qt.*	*pi.*
(40)	8	0	0	0	1
	4	3	62	3	1

ALE AND BEER MEASURE.

	A.hhd.	*gal.*	*qt.*	*pi.*
(41)	76	46	0	1
	65	21	3	0

(Page 26.)

	B.hhd.	*gal.*	*qt.*	*pi.*
(42)	89	49	3	1
	61	21	0	0

	A.hhd.	*gal.*	*qt.*	*pi.*
(43)	90	0	0	0
	87	46	3	1

	B.hhd.	*gal.*	*qt.*	*pi.*
(44)	64	51	3	0
	15	20	1	1

DRY MEASURE.

	Lasts.	*qr.*	*bu.*	*pec*	*gal.*
(45)	6	4	6	3	1
	2	2	3	2	0

	Lasts.	*qr.*	*bu.*	*pec.*	*gal.*
(46)	9	9	7	3	1
	4	2	4	1	0

	Lasts.	*qr.*	*bu.*	*pec.*	*gal.*
(47)	8	9	2	1	0
	6	3	7	1	1

	Lasts.	*qr.*	*bu.*	*pec.*	*gal.*
(48)	8	1	3	2	0
	4	9	1	3	1

TIME.

	Years.	*mo.*	*w.*	*days.*
(49)	86	9	3	6
	24	2	1	3

	Days.	*ho.*	*mi.*	*sec.*
(50)	74	18	54	48
	31	10	21	32

	Years.	*mo.*	*w.*	*days.*
(51)	48	0	1	6
	21	9	3	2

	Days.	*ho.*	*mi.*	*sec.*
(52)	68	10	0	0
	23	20	40	35

MOTION.

	S.	°	′	″	‴
(53)	9	24	36	48	9
	4	20	21	18	4

	S.	°	′	″	‴
(54)	8	27	48	22	34
	4	12	21	12	58

	S.	°	′	″	‴
(55)	5	26	18	44	56
	2	12	51	10	21

	S.	°	′	″	‴
(56)	9	8	20	10	4
	4	21	46	32	56

SQUARE MEASURE.

	Yds.	*ft.*	*inch.*
(57)	42	6	136
	12	4	21

	Yds.	*ft.*	*inch.*
(58)	89	8	121
	22	4	48

	Yds.	*ft.*	*inch.*
(59)	48	2	123
	23	6	101

	Yds.	*ft.*	*inch.*
(60)	65	7	24
	32	1	32

SOLID MEASURE.

	Yds.	*ft.*	*inch.*
(61)	3	25	1467
	1	12	1234

	Yds.	*ft.*	*inch.*
(62)	5	23	1684
	3	12	1212

	Yds.	*ft.*	*inch.*
(63)	6	24	1686
	2	18	1028

	Yds.	*ft.*	*inch.*
(64)	8	0	0000
	2	24	1716

APPLICATION. (Page 27.)

Queſt. 1. What is the difference between 86l 0s 6¼d, and 31l 18s 11d? Anſ. £54 1 7¼

2. B. lends C. 200l. how much is C. in his debt after B. has taken goods of him to the amount of 84l 6s 4d? Anſ. £115 13 8

3. What is the difference between 18308, and the ſum of 1508 added to 610? Anſ. 16190

4. A gentleman built a houſe, and furniſhed it for 1100l 8s 4½d. the houſe coſt 742l 10s 6d, what did the furniture ſtand him in? Anſ. £357 17 10½

5. An apprentice is to ſerve his maſter till he is twenty-one years of age, who is 14 years, 12 months, 11 weeks, 10 days, 9 hours, and 8 minutes old, how long has he to ſerve? Anſ. 5 yrs. 10 mo. 3 w. 3 d. 14 h. 52 mi.

6. A trader failing was indebted to A 86l 10s 6d, to B 36l, to C 20l 12s 4½d, to D 56l 18s, to E 10l 10s 3d, and to F 86l 8s 6d. At the time of this diſaſter he had by him in caſh 10l, in commodities 21l 12s, in houſehold furniture 42l 0s 6d, in recoverable book debts 62l 13s 6d, in plate 12l 4s 4d, ſuppoſing theſe things are all ſurrendered to his creditors, what will they then loſe by him? Anſwer £148 9 3½

COMPOUND MULTIPLICATION.

RULE:—Multiply the price of one by the quantity given, the product is the anſwer.

2. If the given quantity is above 12, multiply by any two numbers, which multiplied together will make the ſame number.

3. If no two numbers multiplied together will make the exact number, find the neareſt to it, either greater or leſs, which can be ſo produced; then, after multiplying by the component parts as before, to or from the laſt product, add or ſubtract the produce of as many as it is leſs or greater than the given number, and it will give the anſwer required.

EXAMPLES. (Page 28—40)

1. If 1 yard of ſilk coſt 16s 4d, what will three yards coſt?

	s.	*d.*	
	16	4	
		3	
£ 2	9	0	Anſwer

2. If 1 yard of drugget coſt 7s 3d, what will 4 yards coſt? Anſwer £1 9 0

3. What will 5 ells of dowlas come to at 1s 2d per ell? Anſwer £0 5 10

4. What will 6 pounds of raiſins come to at 7½ per pound? Anſwer £0 3 9

5. If 1 pound of green tea coſt 9s 6d, what will 7 pounds coſt? Anſwer £3 6 6

6. If 1 yard of ribbon coſt 2s 4d, what will 8 yards of the ſame coſt? Anſwer £0 18 8

7. Suppoſe one ſolid foot of timber coſt me 1s 9d, what will 9 coſt? Anſwer £0 15 9

8. What muſt be given for 10 pounds of tobacco at 2s 2½d per pound? Anſwer £1 2 1

9. How much will 11 hundred weight of ſugar come to at 2l 1s 4d per hundred weight? Anſwer £22 14 8

10. If 1 quarter of oats coſt 1l 4s 3d, what muſt be paid for 12 quarters? Anſwer £14 11 0

11. What will 14 pounds of indigo come to at 17s 6d per pound? Anſwer £12 5 0

12. Suppoſe I pay 7s 10½d for 1 pound of tea, how much will 15 pounds coſt at that rate? Anſwer £5 18 1½

13. If 1 moidore be worth 1l 7s ſterling, what is the value of 16 moidores? Anſwer £21 12 0

14. If 1 piſtole is worth 17s 6d ſterling, how many pounds muſt I pay for 18? Anſwer £15 15 0

15. What will 20 hundred weight of cheeſe come to at 1l 18s 8d per hundred weight? Anſwer £38 13 4

16. What will 21 ells of holland come to at 5s 7½d per ell? Anſwer £5 18 1½

17. What will 22 hundred weight of tobacco come to at 5l 11s 4d per hundred weight? Anſwer £122 9 4

18. If 1 hundred weight of hops coſt 4l 7s 2d, what will 24 hundred weight coſt? Anſwer £104 12 0

19. If 1 pair of ſtockings coſt 4s 6d, what will 25 pair coſt? Anſwer £5 12 6

20. What will 27 pair of ſilk gloves come to at 5s 11½d per pair? Anſwer £8 0 10½

21. What will 28 dozen of lemons come to at 2s 8d per dozen? Anſwer £3 14 8

22. How much will 30 hundred weight of hemp come to at 1l 12s per hundred weight? Anſwer £48 0 0

23. How much will 32 yards of ſhalloon coſt at 1s 9d per yard? Anſwer £2 16 0

24. What will 33 tons of hay come to at 1l 2s per ton? Anſwer £36 6 0

25. If 1 yard of broad cloth coſt 1l 2s 6d, what will 35 yards coſt? Anſwer £39 7 6

26. If 1 gallon of oil coſt 6s 2½d, what will 36 gallons coſt? Anſwer £11 3 6

27.

27. How much muſt be paid for 40 firkins of butter at 1l 12s 6d per firkin? Anſwer £65 0 0

28. What will 42 Glouceſter cheeſes come to at 6s 4½d each? Anſwer £13 7 9

29. What will 44 gallons coſt at 19s 10d per gallon? Anſwer £43 12 8

30. Bought 45 yards of ſuperfine broad cloth at 19s 4d per yard, what did the whole lie me in? Anſ. £43 10 0

31. If 1 yard of German ſerge coſt 3s 7d, what will 48 yards coſt? Anſwer £8 12 0

32. If 1 yard of Iriſh cloth coſt 2s 5½d, what will 50 yards coſt? Anſwer £6 2 11

33. What will 54 chaldron of coals come to at 1l 16s 6d per chaldron? Anſwer £98 11 0

34. What muſt be given for 55 tons of coals if 1 ton coſt 1l 10s? Anſwer £ 82 10 0

35. How much will 56 quarters of barley come to at 1l 2s 6d per quarter? Anſwer £63 0 0

36. How much will 60 buſhels of wheat coſt at the rate of 6s 9d per buſhel? Anſwer £20 5 0

37. If 1 buſhel of oats coſt 4s 3d, what will 63 buſhels coſt? Anſwer £13 7 9

38. What will 64 buſhels of beans come to at 4s 8d per buſhel? Anſwer £14 18 8

39. What will 66 pounds of hops come to at 1s 6½d per pound? Anſwer £5 1 [illegible]

40. What will 70 hundred weight of hay come to at 1s 4d per hundred weight? Anſwer £4 13 4

41. If a gallon of ale coſt 1s 8d how much muſt be paid for 72 gallons? Anſwer £6 0 0

42. If 1 groſs of buttons coſt 3s 2¼d how much will 77 groſs coſt? Anſwer £12 5 5¼

43. What coſt 80 barrels of oyſters at 3s 6d per barrel? Anſwer £14 0 0

44. What will 81 yards of painting come to at 7½ per yard? Anſwer £2 10 7½

45. How much will 84 hogſheads of tobacco come to at 21l 4s 6d per hogſhead? Anſwer £1782 18 0

46. What will 88 hundred weight of fuſtic come to at the rate of 4s 6d per hundred weight? Anſwer £19 16 0

47. What will 90 reams of paper coſt at 6s per ream? Anſwer £27 0 0

48. If one piece of lawn coſt 2l 10s, what will 96 pieces coſt ? Anſ. £240 0 0

49. If one piece of Yorkſhire cloth coſt 8l 10s, what will 99 pieces coſt ? Anſ. £841 10 0

50. What will 100 ſtone of wool come to at 17s per ſtone ? Anſ. £85 0 0

51. What will 108 dozen of Banbury locks come to at 5s 6d per dozen ? Anſ. £29 14 0

52. What will 110 dozen of knives and forks come to at 1s 10d per dozen ? Anſ. £10 1 8

53. What will 120 ſlide rules come to at 2s 8d each ? Anſ. £16 0 0

54. What will 121 Gunter's ſcales come to at 1s 2d each ? Anſ. £7 1 2

55. What will 132 dozen of black lead pencils come to at 2s 4d per dozen ? Anſ. £15 8 0

56. What will 144 braſs locks come to at 2s 2d each ? Anſ. £15 12 0

57. If one pound of cheeſe coſt 4½d, how much will one hundred weight coſt ? Anſ. £1 19 8

58. If one pound of iron coſt 3½d, how much muſt be paid for 2 hundred weight ? Anſ. £3 5 4

59. What will 3 hundred weight of cheeſe come to at 5½d per pound ? Anſ. £7 14 0

60. If one ounce of ſilver coſt 5s 4d, what will 360 ounces coſt ? Anſ. £96 0 0

61. What will 560 ounces of green verditure coſt at 1s 4d per ounce ? Anſ. £37 6 8

62. How much muſt I pay per annum for 1728 acres of land, at the rate of 1l 2s 2d per acre ? Anſ. £1915 4 0

63. What will 17 cruet frames come to at 5s 6d each ? Anſ. £4 13 6

64. What will 23 dozen of bone knives and forks come to at 3s 6d per dozen ? Anſ. £4 0 6

65. What will 29 dozen of pen-knives come to at 14s 6d per dozen ? Anſ. £21 0 6

66. How much will 34 pair of braſs candleſticks come to at 3s 6d per pair ? Anſ. £5 19 0

67. What will 37 pair of iron candleſticks come to at 9d per pair ? Anſ. £1 7 6

68. What will 43 pair of buckles come to at 2s 2d per pair ? Anſ. £4 13 2

69.

69. What will 39 pounds of tea come to at 12s 6½d per pound?
Anſwer £24 9 1½

70. If 1 yard of diaper coſt 1s 6½d, what will 47 yards coſt?
Anſwer £3 12 5½

71. If 1 pair of ſnuffers coſt 9d, what will 53 pair coſt?
Anſwer £1 19 9

72. What will 59 ſcale-beams come to at 6s 6d each?
Anſwer £19 3 6

73. How much muſt be paid for 71 gold balances at 1s 8d each?
Anſwer £5 18 4

74. If 1 dozen of gilt buttons coſt 4s 8d, what will 83 dozen coſt?
Anſwer £19 7 4

75. What will 89 tons of coals come to at 6s 8d per ton?
Anſwer £29 13 4

76. If 1 dozen of ſoap coſt 6s 8d, what will 97 dozen coſt?
Anſwer £32 6 8

77. If 1 dozen of London ſpelling books coſt 8s 2d, what will 106 dozen coſt?
Anſwer £43 5 8

78. What will 109 pair of ſilk ſtockings come to at 10s 2d per pair?
Anſwer £55 8 2

79. What will 123 dozen of candles come to at 5s 6½d per dozen?
Anſwer £34 1 7¼

80. What will 145 hundred weight of raiſins come to at 1l 3s 2d per hundred weight?
Anſwer £167 19 2

81. If 1 pound of ſugar coſt 9d, what will 25¼ pounds coſt?
Anſwer £0 18 11¼

82. If 1 pound of tobacco coſt 2s 4½d, what will 30½ pounds coſt?
Anſwer £3 12 5¼

83. How much muſt be paid for 35¾ barrels of ale, if 1 barrel coſt 1l 10s 6d?
Anſwer £54 10 4½

84. How much will 40½ acres of land come to at 32l 2s 6d per acre?
Anſwer £1301 1 3

85. What will 64¼ tons of hay come to at 2l 12s per ton?
Anſwer £167 1 0

86. What will 81½ yards of broad cloth come to at 1l 4s per yard?
Anſwer £97 16 0

87. If 1 pound of feathers coſt 2s 4d, how much will a feather bed come to that weighs 108¼ pounds?
Anſwer £12 12 7

88. What will 120½ ells of holland come to at 6s 8½d per ell?
Anſwer £40 8 4¼

89. Suppoſe I buy deal at 1s 4d per foot, what will $132\frac{1}{4}$ feet lie me in? Anſ. £8 16 4

90. What will $144\frac{1}{2}$ gallons of Britiſh brandy come to a 9s 2d per gallon? Anſ. £66 4 7

91. How much muſt be paid for $117\frac{1}{4}$ yards of cloth a the rate of 1l 5s 6d per yard? Anſ. £149 9 $10\frac{1}{2}$

92. What muſt be paid for $145\frac{1}{2}$ gallons of French brandy, when the price of one gallon is 12s $9\frac{1}{2}$d?

Anſ. £93 1 $2\frac{1}{4}$

93. If one acre of land coſt 60l 2s $4\frac{1}{2}$d, what will $1441\frac{1}{2}$ acres coſt? Anſ. £86661 3 $6\frac{3}{4}$

94. What will $1729\frac{3}{4}$ ſolid feet of marble coſt at the rate of 1l 5s 3d per ſolid foot? Anſ. £2183 16 $2\frac{1}{4}$

95. What will a year's ſalary amount to at the rate of 1l 4s $10\frac{1}{4}$d per day? Anſ. £453 11 $9\frac{1}{4}$

96. Suppoſe a perſon in trade can clear 362l 10s $6\frac{1}{2}$d a year, how much will he clear in $13\frac{1}{2}$ years trading?

Anſ. £4894 2 $3\frac{3}{4}$

97. If the cloathing of one ſoldier coſt 4l 4s $3\frac{1}{4}$d, what will the cloathing of an army, conſiſting of 9652 men, coſt Government? Anſ. £40669 2 1

98. A gentleman hath 2264l per annum, and his expences one day with another are 3l 2s $6\frac{1}{4}$d, I deſire to know how much he layeth up at the year's end? Anſ. £1122 19 $10\frac{3}{4}$

99. What is the weight of 37 hogſheads of tobacco, each weighing 8 cwt. 1 qr. 21 lb? Anſ. Cwt. 312 0 21

100. What is the weight of 109 hogſheads of ſugar, each weighing 9 cwt. 1 qr. 12 lb? Anſ. Cwt. 1019 3 20

COMPOUND DIVISION.

RULE—1. Place the numbers as in ſimple diviſion, and divide each denomination, beginning at the left hand, by the diviſor, ſetting the quotients under their reſpective dividends.

2. If there be a remainder after dividing any of the denominations, except the leaſt, find how many of the next lower denomination it is equal to, and add it to the number, if any, which was in this denomination before; then divide the ſame as uſual, and ſo on till the whole is finiſhed.

3. If the diviſor exceeds twelve, divide continually by its component parts, as in ſimple diviſion.

4. If the diviſor cannot be produced by the multiplication of ſmall numbers, divide by it after the manner of long diviſion.

EXAMPLES. (Pages 41—54.)

1. If 3 yards of ſilk coſt 2l 9s, what will one yard coſt?

£. s. d.
3)2 9 0
£.0 16 4 Anſ.

2. If 4 yards of drugget coſt 1l 9s, what will one yard coſt? Anſ. 7s 3d

3. If five ells of dowlas coſt 5s 10d, what will one ell coſt? Anſ. 1s 2d

4. If 6 pounds of raiſins coſt 3s 9d, what will one pound coſt? Anſ. 7½d

5. If 7 pounds of green tea coſt 3l 6s 6d, what will one pound coſt? Anſ. 9s 6d

6. If 8 yards of ribbon coſt 18s 8d, what is that per yard? Anſ. 2s 4d

7. If 9 feet of timber coſt 15s 9d, what will one foot coſt? Anſ. 1s 9d

8. If ten pounds of tobacco coſt 1l 2s 1d, what is that a pound? Anſ. 2s 2½d

9. If 11 hundred weight of ſugar coſt 22l 14s 8d, what will one hundred weight coſt? Anſ. 2 1 4

10. If 12 quarters of oats coſt 14l 11s, what will one quarter coſt? Anſ. £1 4 3

11. If 14 pounds of tea coſt 12l 5s, what is that per pound? Anſ. 17s 6d

12. If 15 pounds of bohea tea coſt 5l 18s 1½d, what will one pound coſt? Anſ. 7s 10½d

13. If 16 moidores are worth 21l 12s, what is the value of one? Anſ. 1 7 0

14. If 18 piſtoles are worth 15l 15s, what is the value of one? Anſ. 17s 6d

15. If 20 hundred weight of cheeſe coſt 38l 13s 4d, what is that per hundred weight? Anſ. £1 18 8

16. If 21 ells of holland coſt 5l 18s 1½d, what will one ell coſt? Anſ. 5s 7½d

17. If 22 hundred weight of tobacco coſt 122l 9s 4d, what will one hundred weight coſt? Anſ. £5 11 4

18. If 24 hundred weight of hops coſt 104l 12s, what will one hundred weight coſt? Anſ. £4 7 2

19. If 25 pair of thread ſtockings coſt 5l 12s 6d, how much is that per pair? Anſ. 4s 6d

20. If 27 pair of ſilk gloves coſt 8l 0s 10½d, what coſt one pair? Anſ. 5s 11½d

21. If 28 dozen of lemons coſt 3l 14s 8d, what will one dozen coſt? Anſ. 2s 8d

22. If 30 hundred weight of hemp coſt 48l, what is that per hundred weight? Anſ. £1 12 0

23. If 32 yards of ſhalloon coſt 2l 16s, what will one yard coſt? Anſ. 1s 9d

24. If 33 tons of hay coſt 36l 6s, what will one ton coſt? Anſ. £1 2 0

25. If 35 yards of broad cloth coſt 39l 7s 6d, how much is that per yard? Anſ. £1 2 6

26. If 36 gallons of linſeed oil coſt 11l 3s 6d, what will one gallon coſt? Anſ. 6s 2½d

27. If 40 firkins of butter coſt 65l, what will one firkin coſt? Anſ. £1 12 6

28. If 42 Glouceſter cheeſes coſt 13l 7s 9d, what will one cheeſe coſt? Anſ. 6s 4½d

29. If 44 gallons of wine coſt 43l 12s 8d, what is that per gallon? Anſ. 19s 10d

30.

30. If 45 yards of ſuperfine broad cloth coſt 43l 10s, how much is that a yard? Anſwer 19s 4d

31. If 48 yards of German ſerge coſt 8l 12s, what will one yard coſt? Anſwer 3s 7d

32. If 50 yards of Iriſh cloth coſt 6l 2s 11d, what will one yard coſt? Anſwer 2s 5½d

33. If 54 chaldron of coals coſt 98l 11s, what will one chaldron coſt? Anſwer £1 16 6

34. If 55 chaldron of coals coſt 82l 10s, what will one chaldron coſt? Anſwer £1 10 0

35. If 56 quarters of barley coſt 63l, how much is that per quarter? Anſwer £1 2 6

36. If 60 buſhels of wheat coſt 20l 5s, what will one buſhel coſt? Anſwer 6s 9d

37. If 63 buſhels of oats coſt 13l 7s 9d, what will one buſhel coſt? Anſwer 4s 3d

38. If 64 buſhels of beans coſt 14l 18s 8d, what will one buſhel coſt? Anſwer 4s 8d

39. If 66 pounds of hops coſt 5l 1s 9d, what is that per pound? Anſwer 1s 6½d

40. If 70 hundred weight of hay coſt 4l 13s 4d, what will one hundred weight coſt? Anſwer 1s 4d

41. If 72 gallons of ale coſt 6l, what is that per gallon? Anſwer 1s 8d

42. If 77 groſs of buttons coſt 12l 5s 5½d, how much is that per groſs? Anſwer 3s 2¼d

43. If 80 barrels of oyſters coſt 14l, what coſt one barrel? Anſwer 3s 6d

44. If 81 yards of painting coſt 2l. 10s 7½d, what is that per yard? Anſwer 7½d

45. If 84 hogſheads of tobacco coſt 1782l 18s, what will one hogſhead coſt? Anſwer £21 4 6

46. If 88 hundred weight of fuſtic coſt 19l 16s, what is the value of one hundred weight? Anſwer 4s 6d

47. If 90 reams of paper coſt 27l, what will one ream coſt? Anſwer 6s

48. If 96 pieces of lawn coſt 240l, what is the value of one piece? Anſwer £2 10 0

49. If 99 pieces of Yorkſhire cloth coſt 841l 10s, what will one piece coſt? Anſwer £8 10 0

50. If 100 ſtone of wool coſt 85l, what is the price of one ſtone? Anſwer 17s.

51. If 108 dozen of Banbury locks coſt 29l 14s, what will one dozen coſt? Anſ. 5s 6d

52. If 110 dozen of knives and forks coſt 10l 1s 8d, what will one dozen coſt? Anſ. 1s 10d

53. If 120 ſlide rules coſt 16l, what will one coſt? Anſ. 2s 8d

54. If 121 Gunter's ſcales coſt 7l 1s 2d, what is the value of one? Anſ. 1s 2d

55. If 132 dozen of black lead pencils coſt 15l 8s, what coſt one dozen? Anſ. 2s 4d

56. If 144 braſs locks coſt 15l 12s, how much is that per lock? Anſ. 2s 2d

57. If 112 pound, or 1 hundred weight of cheeſe coſt 1l 19s 8d, how much is that a pound? Anſ. 4¼d

58. If 224 pound, or 2 hundred weight of iron coſt 3l 5s 4d, what coſt one pound? Anſ. 3½d

59. If 336 pound, or 3 hundred weight of ſugar coſt 7l 14s, what coſt one pound? Anſ. 5½d

60. If 360 ounces of ſilver coſt 96l, what will one ounce coſt? Anſ. 5s 4d

61. If 560 pounds of ſaltpetre coſt 37l 6s 8d, what coſt one pound? Anſ. 1s 4d

62. If 1728 acres of land coſt 1915l 4s, what is the value of one acre? Anſ. £1 2 2

63. If 17 cruet frames coſt 4l 13s 6d, what will one coſt? Anſ. 5s 6d

64. If 23 dozen of bone knives and forks coſt 4l 0s 6d, what coſt one dozen? Anſ. 3s 6d

65. If 29 dozen of penknives coſt 21l 0s 6d, what will one dozen coſt? Anſ. 14s 6d

66. If 34 pair of braſs candleſticks coſt 5l 19s, what will one pair coſt? Anſ. 3s 6d

67. If 37 pair of iron candleſticks coſt 1l 7s 9d, what coſt one pair? Anſ. 9d

68. If 43 pair of buckles coſt 4l 13s 2d, what will one pair coſt? Anſ. 2s 2d

69. If 39 pounds of tea coſt 24l 9s 1½d, what coſt one pound? Anſ. 12s 6½d

70. If 47 yards of diaper coſt 3l 12s 5½d, what coſt one yard? Anſ. 1s 6½d

71. If 53 pair of ſteel ſnuffers coſt 1l 19s 9d, what will one pair coſt? Anſ. 9d

72. If 59 ſcale beams coſt 19l 3s 6d, how much is that per pair? Anſ. 6s 6d

73. If 71 gold balances coſt 5l 18s 4d, what coſt one? Anſ. 1s 8d

74. If 83 dozen of gilt buttons coſt 19l 7s 4d, what will one dozen coſt? Anſ. 4s 8d

75. What are coals per ton, if 89 tons coſt 29l 13s 4d? Anſ. 6s 8d

76. If 97 dozen of ſoap coſt 32l 6s 8d, what coſt one dozen? Anſ. 6s 8d

77. If 106 dozen of ſpelling books coſt 43l 5s 8d, what will one dozen coſt? Anſ. 8s 2d

78. What are ſilk ſtockings per pair, if 109 pair coſt 55l 8s 2d? Anſ. 10s 2d

79. If 123 dozen pounds of candles coſt 34l 1s 7½d, what coſt one dozen pounds? Anſ. 5s 6½d

80. What are raiſins per hundred weight, if 145 hundred weight coſt 167l. 19s 2d? Anſ. £1 3 2

81. If 25¼ pounds of ſugar coſt 18s 11¼d, what will one pound coſt? Anſ. 9d

82. If 30½ pounds of tobacco coſt 3l 12s 5¼d, what will one pound coſt? Anſ. 2s 4½d

83. If 35¾ barrels of ale coſt 54l 10s 4½d, what is that per barrel? Anſ. £1 10 6

84. If 40½ acres of land coſt 1301l 1s 3d, how much is that per acre? Anſ. £32 2 6

85. If 64¼ tons of hay coſt 167l 1s, what coſt one ton? Anſ. £2 12 0

86. If 81½ yards of broad cloth coſt 97l 16s, what will one yard coſt? Anſ. £1 4 0

87. If 108¼ pounds of feathers coſt 12l 12s 7d, what coſt one pound? Anſ. 2s 4d

88. If 120½ ells of Holland coſt 40l 8s 4½d, what coſt one ell? Anſ. 6s 8½d

89. If 132¼ feet of deal coſt 8l 16s 4d, what coſt 1 foot? Anſ. 1s 4d

90. If 144½ gallons of brandy coſt 66l 4s 7d, how much will one gallon coſt? Anſ. 9s 2d

91. If 117¼ yards of cloth coſt 149l 9s 10½d, what coſt one yard? Anſ. £1 5 6

92. If 145½ gallons of brandy coſt 93l 1s 2¼d, what is that per gallon? Anſ. 12s 9½d

93.

93. What is land per acre, if $1441\frac{1}{2}$ acres coſt 86661 3s $6\frac{1}{4}$d? Anſ. £60 2 $4\frac{1}{2}$

94. If $1729\frac{1}{4}$ feet of marble coſt 2183l 16s $2\frac{1}{4}$d, what is the price of one foot? Anſ. £1 5 3

95. If an officer's ſalary be 453l 11s $9\frac{1}{4}$d a year, how much is that per day? Anſ. £1 4 $10\frac{1}{4}$

96. Suppoſe a perſon by trading can clear 4894l 2s $3\frac{3}{4}$d in $13\frac{1}{2}$ years, what is his yearly increaſe of fortune?

Anſ. £362 10 $6\frac{1}{2}$

97. If the cloathing of an army, conſiſting of 9652 men, coſt government 40669l 2s 1d, how much is that per man?

An £4 4 $3\frac{1}{4}$

98. Suppoſe a gentleman has an eſtate of 2264l per annum, how much is his daily expences, if he layeth up 1122l 19s $10\frac{3}{4}$d at the year's end? Anſ. £3 2 $6\frac{1}{4}$

99. If 37 hogſheads of tobacco weigh 312 hundred weight 21 pounds, what is the weight of one hogſhead?

Anſ. C. 8 1 21

100. If 109 hogſheads of ſugar weigh 1019 hundred weight 3 quarters 20 pounds, what is the weight of one hogſhead? Anſ. C. 9 1 12

DUODECIMALS.

THIS rule is ſo called becauſe the integer is divided into twelve equal parts.

RULE:—1. Under the multiplicand, write the correſpondent denominations of the multiplier.

2. Multiply each term in the multiplicand, beginning with the loweſt, by the feet in the multiplier, placing each reſult under its reſpective term, obſerving to carry an unit for every twelve from each lower denomination to its next ſuperior.

3. Work in the ſame manner with the inches and parts, ſetting the reſult of each term one place more to the right hand, and the ſum of all will be the product required.

EXAMPLES. (Pages 54—58.)

Ex. 1. Multiply 6 feet 6 inches, by 3 feet 2 inches.

	F.	*I.*	
	6	6	
	3	2	
	19	6	
	1	1	0
F	20	7	0 Anſ.

2. Multiply 8 feet 4 inches by 5 feet 3 inches.
Anſ. *F* 43 9

3. Multiply 12 feet 6 inches by 8 feet 5 inches.
Anſ. *F* 105 2 6

4. Multiply 26 feet 4 inches by 12 feet 7 inches.
Anſ. *F* 331 4 4

5. Multiply 76 feet 6 inches by 48 feet 3 inches.
Anſ. *F* 3691 1 6

6. Multiply 45 feet 6 inches by 38 feet 7 inches.
Anſ. *F* 1755 6 6

7. Multiply 84 feet 2 inches by 79 feet 2 inches.
Anſ. *F* 6663 2 4

8. Multiply 126 feet 6 inches by 121 feet 3 inches.
Anſ. *F* 15338 1 6

9. Multiply 764 feet 5 inches by 192 feet 4 inches.
Anſ. *F* 147022 9 8

10. Multiply 7681 feet 8 inches by 1926 feet 10 inches.
Anſ. *F* 14801291 4 8

11. Multiply 7 feet 3 inches 3 parts by 1 foot 7 inches 6 parts.
Anſ. *F* 11 9 9 4 6

12. Multiply 8 feet 6 inches 6 parts by 7 feet 3 inches 4 parts.
Anſ. *F* 62 1 11 8

13. Multiply 4 feet 10 inches 6 parts by 2 feet 4 inches 8 parts.
Anſ. *F* 11 7 9

14. Multiply 7 feet 8 inches 6 parts by 7 feet 2 inches 8 parts.
Anſ. *F* 55 8 0 8

15. Multiply 3 feet 6 inches 3 parts by 2 feet 4 inches 6 parts.
Anſ. *F* 8 4 4 1 6

16.

16. Multiply 12 feet 2 inches 10 parts by 9 feet 6 inches 4 parts. Anſwer F 116 6 11 11 4

17. Multiply 84 feet 7 inches 6 parts by 76 feet 3 inches 3 parts. Anſwer F 6454 5 0 4 6

18. Multiply 87 feet 3 inches 5 parts by 18 feet 1 inch 6 parts. Anſwer F 1580 0 5 1 6

19 Multiply 371 feet 2 inches 3 parts by 181 feet 1 inch 3 parts. Anſwer F 67223 7 2 9 9

20. Multiply 487 feet 10 inches 10 parts by 186 feet 5 inches 6 parts. Anſwer F 90973 6 5 7

21. What is the ſuperficial content of a board whoſe length is 18 feet 6 inches, and breadth 1 foot 2 inches?

Anſwer F 21 7

22. How many feet are contained in a floor 45 feet 6 inches long, and 9 feet 4 inches broad? Anſwer F 424 8

23. How many ſquare yards of paving are there in a court yard, the length of which is 64 feet 6 inches, and breadth 47 feet 8 inches? Anſwer Y 341 5 6

24. How many ſquare yards of paving are there in a ſtreet, the length 864 feet 3 inches, and breadth 62 feet 6 inches?

Anſwer Y 6001 6 7 6

25. If a ceiling be 60 feet 9 inches long, and 22 feet 3 inches broad, how many yards doth it contain?

Anſwer Y 150 1 8 3

26. If a room be painted, whoſe height is 9 feet 3 inches, and its compaſs 40 feet 6 inches, how many yards doth it contain? Anſwer Y 41 5 7 6

27. If a pane of glaſs be 3 feet 8 inches and three quarters long, and 1 foot 4 inches and two quarters broad, how many feet does it contain? Anſwer F 5 1 6 4 6

28. Suppoſe there was a window with 15 panes of glaſs, each 3 feet 7 inches and 3 quarters long, and 1 foot 5 inches and 1 part broad, how many feet of glaſs are contained therein? Anſwer F 77 10 2 11 3

29. How many ſolid feet are there in a beam whoſe breadth is 1 foot 6 inches, depth 1 foot 3 inches, and length 16 feet 3 inches? Anſwer F 30 5 7 6

30. If a beam be 1 foot 5 inches 6 parts by 1 foot 2 inches and 10 parts, and 12 feet 3 inches 7 parts long, how many ſolid feet doth it contain?

Anſwer F 22 2 0 6 2 1

REDUCTION,

IS the altering, or changing numbers from one denomination to another, ſtill retaining the ſame value.

RULE.—Firſt conſider how many of the leſs name concerned make one of the greater, and by that number multiply the given number, if the reduction be deſcending, adding to the product the part of the ſecond name, and ſo on through all the denominations to the laſt; but divide, if aſcending, and the product or quotient, together with the ſeveral remainders, if diviſion be uſed, will be the anſwer.

EXAMPLES. (Pages 58—82.)

Ex. 1. In 20 ſhillings how many pence and farthings?

s.
20
12
240 Pence
4
Anſ. 960 Farthings

2. How many ſhillings are there in 960 farthings? Anſwer 20
3. In 36l how many farthings? Anſwer 34560
4. How many pounds are there in 34560 farthings? Anſwer 36l
5. In 346l 6s 8½d, how many farthings? Anſ. 332481
6. How many pounds in 332481 farthings? Anſwer £346 6 8½
7. In 86 guineas how many farthings? Anſ. 86688
8. How many guineas are there in 86688 farthings? Anſwer 86 g.
9. In 384l how many four-pences? Anſ. 23040
10. How many pounds in 23040 groats? Anſ. 384l
11. In 682 moidores how many farthings? Anſ. 883872

12.

12. How many moidores in 183872 farthings?
Anſwer 682

13. In 1000l how many crowns, half crowns, and pence?
Anſ. 4000 crowns, 8000 half crowns, 240000 pence.

14. Reduce 240000 pence to crowns, half crowns, and pounds. Anſ. 8000 half crowns, 4000 crowns, 1000l.

15. In 234l how many crowns, ſhillings, groats, and pence? Anſ. 936 c. 4680 ſhil. 14040 gr. 56160 pence.

16. Reduce 56160 pence to groats, ſhillings, crowns, and pounds. Anſ. 14040 gr. 4680 ſhil. 936 c. 234l.

17. In 152l how many ſhillings and crowns?
Anſwer 3040 ſhillings, 608 crowns

18. In 608 crowns, how many ſhillings and pounds?
Anſwer 3040s 152l

19. In 695l 8s, how many ducats, at 4s 9d each?
Anſwer 2928

20. In 2928 ducats, each in value 4s 9d, how many pounds? Anſwer £695 8

21. In 4321l 13s 9d, how many pieces at 13½d each?
Anſwer 76830 pieces

22. In 76830 pieces of 13½d each, how many pounds?
Anſwer £4321 13 9

23. In 16 ingots of gold, each in value 36 guineas, how many quarter guineas may be made thereout?
Anſwer 2304

24. In 2304 quarter guineas, how many ingots will they make, the value of each ingot 36 guineas? Anſ. 16

25. In 993l 4s 6d, how many dollars at 4s 3d each?
Anſwer 4674 dollars

26. In 4674 dollars, at 4s 3d each, how many pounds?
Anſwer £993 4 6

27. In 360 talents of ſilver, each 357l 11s 10½d, how many farthings? Anſwer 123584400

28. In 123584400 farthings, how many talents of ſilver, each in value 357l 11s 10½d? Anſwer 360

29. In 426l 14s, how many crowns, half crowns, and ſhillings, and of each an equal number? Anſ. 1004

30. In 1004 crowns, as many half crowns, and the ſame number of ſhillings, how many pounds?
Anſwer £426 14

31. A merchant agrees with a caſhier to change 58l 2s 6d for pieces of 13½d, 12d, 9d, 6d, 4d, and of 2d, and to

have of each ſort an equal number of pieces, I deſire to know the number? Anſ. 300

32. A merchant has received from a caſhier three hundred pieces of each of the following ſorts, viz. 13½d, 12d, 9d, 6d, 4d, and 2d, how many pounds muſt the caſhier receive for the ſame? Anſ. £58 2 6

33. In 1120 dollars, at 4s 3d each, how many pounds? Anſ. 238

34. In 238l, how many dollars at 4s 3d each? Anſ. 1120

35. In 560 piſtoles, at 17s each, how many pounds? Anſ. 476

36. In 476l, how many piſtoles at 17s each? Anſ. 560

37. In 800 quarter guineas, how many pounds? Anſ. 210

38. In 210l, how many quarter guineas? Anſ. 800

39. In 896 nobles, at 6s 8d each, how many pounds? Anſ. £298 13 4

40. In 298l 13s 4d, how many nobles at 6s 8d each? Anſ. 896

41. How many moidores are equal in value to 225 guineas? Anſ. 175

42. In 175 moidores, how many guineas? Anſ. 225

43. How many crowns are equal to 170 piſtoles, at 17s each? Anſ. 578

44. How many piſtoles, at 17s each, are equal to 578 crowns? Anſ. 170

45. How many ducatoons, at 5s 6½d each, are worth 14630 cobs, at 4s 7d each? Anſ. 12100

46. How many cobs, at 4s 7d each, are worth 12100 ducatoons, at 5s 6½d each? Anſ. 14630

47. How many milreas, at 6s 8½d each, are worth 644 Romiſh crowns, at 7s 6d each? Anſ. 720

48. How many Romiſh crowns, at 7s 6d each, are worth 720 milreas, at 6s 8½d each? Anſ. 644

49. In 23 pounds of ſilver, how many grains? Anſ. 132480

50. How many pounds of ſilver are there in 132480 grains? Anſ. 23lb.

51. In 18 pounds, 6 ounces, 8 pennyweights, and 4 grains of ſilver, how many grains? Anſ. 106756

52. In 106756 grains of ſilver, how many pounds? Anſ. 18lb. 6 oz. 8 dwts. 4 grs.

53. In 8 ingots of ſilver, each weighing 3lb. 4 oz. 2 dwts. 9 grs. how many grains? Anſ. 154056

54. How many ingots of ſilver, 3lb. 4 oz. 2 dwts. 9 grs. each, are there in 154056 grains? Anſ. 8 ingots

55. How many ſilver tankards, each weighing 55 ounces, 9 pennyweights, 14 grains, can a ſilverſmith make out of 41 pounds, 7 ounces, 6 pennyweights, 6 grains of ſilver? Anſ. 9

56. In 9 ſilver tankards, each weighing 55 ounces, 9 pennyweights, 14 grains, how many pounds? Anſ. 41lb. 7 oz. 6 dwts. 6 grs.

57. In 24 pounds of apothecaries drugs, how many grains? Anſ. 138240

58. In 138240 grains, how many pounds? Anſ. 24

59. In 421 pounds, 6 ounces, 3 drams, 2 ſcruples, and 9 grains, how many grains? Anſ. 2428069

60. In 2428069 grains, how many pounds? Anſ. 421lb. 6oz. 3 dr. 2 ſcr. 9 gr.

61. Suppoſe the Gentlemen of the Faculty belonging to the General Hoſpital at Birmingham, make up a medical compoſition of 12 pounds 6 ounces, how many boluſes may be made thereout, each weighing 4 ſcruples, and ſuppoſing theſe boluſes were to be equally divided amongſt 45 patients, how many muſt each one have? Anſ. 20 each

62. Suppoſe 45 patients were to have 20 boluſes each, and each bolus to weigh 4 ſcruples, how many pounds of ingredients will it take to make the whole compoſition? Anſ. 12lb. 6 oz.

63. In 16 tons of iron, how many drams? Anſ. 9175040

64. In 9175040 drams, how many tons? Anſ. 16

65. In 146 tons, 12 hundred weight, 2 quarters, 8 pounds, 4 ounces, 6 drams, how many drams? Anſ. 84082758

66. In 84082758 drams, how many tons? Anſ. 146 tons, 12 cwt. 2 qr. 8lb. 4 oz. 6 drs.

67. In 7 hogſheads of tobacco, each weighing 7 hundred weight, 2 quarters, 21 pounds, how many pounds? Anſ. 6027 pounds

68. How many hogſheads, weight 7 hundred, 2 quarters, 21 pounds each, are there in 6027 pounds? Anſ. 7

69. How many parcels, each weighing 12 pounds 13 ounces, can I make out of 41 hundred weight, 1 quarter, 18 pounds, 2 ounces? Anſ. 362 parcels

70. In 362 parcels, each weighing 12 pounds 13 ounces, how many hundred weight? Anſ. 41 cwt. 1 qr. 18lb. 2 oz.

71. How many parcels of 4 pounds, 6 pounds, 10 pounds, and 12 pounds, can a grocer have out of 4 hogſheads of raiſins, each weighing net 4 hundred weight, 2 quarters, 8 pounds, and to have of each an equal number?

Anſ. 64 parcels

72. A grocer hath 4 hogſheads of raiſins made up into 64 parcels of the following weights, viz. 4 pounds, 6 pounds, 10 pounds, and 12 pounds, and deſires to know how many hundred weight there are in one hogſhead?

Anſ. 4 cwt. 2 qr. 8lb.

73. In 342 yards of cloth, how many nails?

Anſ. 5472

74. How many yards are there in 5472 nails?

Anſ. 342

75. In 62 yards, 2 quarters, 1 nail, how many nails?

Anſ. 1001

76. How many yards in 1001 nails?

Anſ. 62 yds. 2 qr. 1 nail

77. Reduce 40 Engliſh ells, 3 quarters, 2 nails, into nails.

Anſ. 814

78. In 814 nails, how many Engliſh ells?

Anſ. 40 E.E. 3 qr. 2 nails

79. In 84 Flemiſh ells, 2 quarters, and 3 nails, how many nails? Anſ. 1019

80. Reduce 1019 nails to Flemiſh ells.

Anſ. 84 F.E. 2 qr. 3 na.

81. In 36 pieces of cloth, each piece containing 52 yards, how many nails? Anſ. 29952

82. How many pieces of cloth, each piece containing 52 yards, are there in 29952 nails? Anſ. 36

83. How many yards of cloth will cloath 90 charity boys, allowing for each boy 3 yards and a quarter?

Anſ. $292\frac{1}{2}$

84. If 90 charity boys take 292 yards and 2 quarters of cloth to cloath them, how many yards is that per boy?

Anſ. 3 yds. 1 qr.

85. In one league, how many miles, furlongs, and poles? Anſ. 3 m. 24 fur. 960 po.

86. In 960 poles, how many leagues? Anſ. 1

87. In 48 miles, how many furlongs, poles, yards, feet, inches, and barley corns? Anſ. 384 f. 15360 po. 84480 yds. 253440 feet, 3041280 inches, 9123840 b. c.

88. In 9123840 barley corns, how many miles? Anſ. 48

89. How many times doth the wheel, which is 16½ feet in circumference, turn round between Birmingham and Worceſter, being 25 miles aſunder? Anſ. 8000

90. In 8000 turns of a wheel 16½ feet in circumference, how many miles will it run over? Anſ. 25

91. How many paces, feet, inches, and barley corns, will reach round the globe of our earth, ſuppoſing it, according to the beſt computations, to be 25020 miles? Anſ. 26421120 pa. 132105600 ft. 1585267200 in. 4755801600 b. c.

92. In 4755801600 barley corns, how many miles? Anſ. 25020

93. In 484 acres of land, how many poles? Anſ. 77440

94. In 77440 poles, how many acres? Anſ. 484

95. In 4321 acres, 3 roods, 34 poles, how many poles? Anſ. 691514

96. In 691514 poles, how many acres? Anſ. 4321 A. 3 R. 34 P.

97. A certain common, containing 4140 acres, is to be divided into ſhares of 360 perches each, how many ſhares doth the whole contain? Anſ. 1840

98. Suppoſe a common was divided into 1840 equal ſhares of 360 perches each, how many acres are there in the whole? Anſ. 4140

99. In 46 hogſheads of wine, how many pints? Anſ. 23184

100. In 23184 pints of wine, how many hogſheads? Anſ. 46

101. In 46 tons, 3 hogſheads, 45 gallons, 3 quarts, 1 pint, how many pints? Anſ. 94615

102. In 94615 pints, how many tons of wine? Anſ. 46 T. 3 hhd. 45 gal. 3 qr. 1 pi.

103. Out of 15 hogſheads of wine, how many dozen of quart and pint bottles can be filled, ſo as to have of each ſort an equal number? Anſwer 210

104. How many hogſheads of wine will it take to fill 210 dozen quart and as many pint bottles? Anſwer 15

105. In 21 hogſheads of ale, how many pints? Anſwer 8064

106. In 8064 pints of ale, how many hogſheads? Anſwer 21

107. In 30 hogſheads of beer, how many pints? Anſwer 12960

108. In 12960 pints of beer, how many hogſheads? Anſwer 30

109. In 363 barrels of beer, how many hogſheads, gallons, and pints? Anſwer 242 hhd, 1306 gal, 104544 pi.

110. In 104544 pints of beer, how many barrels? Anſwer 363

111. In 6 butts, 1 hogſhead, 40 gallons, 2 quarts of beer, how many hogſheads, barrels, and firkins, and of each an equal number? Anſwer 7 of each, and 198 qts remain

112. Out of a quantity of beer a brewer filled 7 hogſheads, 7 barrels, and 7 firkins, and 198 quarts remaining, how many butts did he brew? Anſ. 6bts, 1hhd, 40gal, 2qts.

113. In 304 quarters of corn, how many gallons? Anſwer 19456

114. In 19456 gallons of corn, how many quarters? Anſwer 304

115. In 4 laſts of corn, how many pints? Anſwer 20480

116. In 20480 pints of corn, how many laſts? Anſwer 4

117. In 2 laſts, 1 wey, 3 quarters, 2 buſhels, 3 pecks, and 1 gallon, how many gallons? Anſwer 1815

118. In 1815 gallons of corn, how many laſts? Anſwer 2 laſts, 1 wey, 3 qrs, 2 bu, 3 pks, 1 gal.

119. In 124 chaldrons of coals, how many pecks? Anſwer 17856

120. In 17856 pecks of coals, how many chaldrons? Anſwer 124

121. In 421 chaldrons, 12 buſhels of coals, how many ſacks, 3 buſhels each? Anſwer 5056

122. In 5056 ſacks of coals, each 3 buſhels, how many chaldrons? Anſwer 421 chal, 12 buſhels

123. How many ſeconds are there in a ſolar year?
Anſ. 31556935

124. In 31556935 ſeconds, how many days?
Anſ. 365 days, 5 h, 48 m, 55″

125. Suppoſe the creation of the world was 4007 years before the birth of Chriſt, how many ſeconds is it ſince to Chriſtmas, 1785, allowing ſolar years? Anſ. 182777767520

126. In 182777767520 ſeconds, how many years?
Anſ. 5792

127. In 12 revolutions, how many ſeconds?
Anſ. 15552000

128. In 15552000 ſeconds of a degree, how many revolutions? Anſ. 12

129. In 41 revolutions, 6 ſigns, 4 degrees, 30 minutes, and 45 ſeconds, how many ſeconds? Anſ. 53800245

130. In 53800245 ſeconds, how many revolutions?
Anſ. 41 rev, 6 ſi, 4 deg, 34′ 45′

131. In one ſquare yard, how many ſquare inches?
Anſ. 1296

132. In 1296 ſquare inches, how many ſquare yards?
Anſ. 1

133. How many ſquare yards are there in a ſtreet, the length of which is 864 feet 3 inches, and breadth 62 feet 6 inches? Anſ. 6001 yds, 6 f, 7 in, 6 p.

134. In one ſquare mile, how many acres, roods, poles, yards, feet, and inches? Anſ. 640A, 2560 r, 102400 p, 3097600 yds, 27878400 ft, 4014489600 in.

135. In 4014489600 ſquare inches, how many ſquare miles? Anſ. 1

136. In one ſolid yard, how many feet and inches?
Anſ. 27 ft, 46656 in.

137. In 46656 ſolid inches, how many ſolid yards?
Anſ. 1

138. How many ſolid feet are there in a beam, whoſe breadth is 18 inches, depth 15 inches, and length 16 feet 3 inches? Anſ. 30 ft, 5 in, 7 pa, 6 ſ.

THE RULE OF THREE DIRECT,

Teacheth from three numbers given, to find a fourth in proportion for the anſwer.

RULE.—State the queſtion; that is, place the numbers ſo, that the firſt and third may be of the ſame name, and the ſecond the ſame as the fourth number required.

2. Bring the firſt and third numbers into the ſame denomination, and the ſecond into the loweſt name mentioned.

3. Multiply the ſecond and third numbers together, and divide the product by the firſt, and the quotient will be the anſwer to the queſtion, in the ſame denomination you left the ſecond number in, which may be brought into any other denomination required.

EXAMPLES. (Pages 83—122.)

Ex. 1. If 3 yards of cloth coſt 18 ſhillings, what will 9 yards coſt?

Yds. : *s.* :: *Yds.*
3 : 18 :: 9
9
3)162
2|0)5|4
£2 14 Anſ.

2. If I gave 2l 14s for 9 yards of cloth, how many yards can I buy for 18s? Anſ. 3 yds

3. If 4 yards coſt 2l, what will 14 yards coſt? Anſ. £7 0 0

4. If 14 yards coſt 7l, how many yards of the ſame can I have for 2l? Anſ. 4 yds

5.

5. If 9 yards of cloth coſt 3l, what will 36 yards coſt?
Anſwer £12 0 0

6. Suppoſe I gave 12l for 36 yards of cloth, how many yards of the ſame can I buy for 3l?
Anſwer 9 yds

7. If 3 yards of ſilk coſt 2l 9s, what will 24 yards coſt?
Anſwer £19 12 0

8. If 19l 12s pay for 24 yards of cloth, how many yards will 2l 9s pay for?
Anſwer 3 yds

9. If 4 yards of drugget coſt 1l 9s, what will 48 yards coſt?
Anſwer £17 8 0

10. Suppoſe I gave 17l 8s for 48 yards of drugget, how many yards can I buy for 1l 9s?
Anſwer 4

11. If 7 yards of cloth coſt 3l 6s 6d, what will 36 coſt?
Anſwer £17 2 0

12. If I give 17l 2s for 36 yards of cloth, how many yards can I buy for 3l 6s 6d?
Anſwer 7

13. If 8 yards of ribbon coſt 18s 8d, what will 54 yards coſt?
Anſwer £6 6 0

14. If 54 yards coſt 6l 6s, how many yards may be bought for 18s 8d?
Anſwer 8

15. If 9 feet of timber coſt 15s 9d, what will 72 feet coſt?
Anſwer £6 6 0

16. Suppoſe I gave 6l 6s for 72 feet of timber, how many feet can I have for 15s 9d?
Anſwer 9

17. If ten pounds of tobacco coſt 1l 2s 1d, what will 81 pounds coſt?
Anſwer £8 18 10½

18. If 81 pounds of tobacco coſt 8l 18s 10½d, how many pounds may be bought for 1l 2s 1d?
Anſwer 10

19. If 12 quarters of oats coſt 14l 11s, what will 90 quarters coſt?
Anſwer £109 2 6

20. Suppoſe I gave 109l 2s 6d for 90 quarters of oats, how many quarters can I have for 14l 11s?
Anſwer 12

21. If 14 pounds of tea coſt 12l 5s, what will 99 pounds coſt?
Anſwer 86 12 6

22. If 99 pounds of tea coſt 86l 12s 6d, how many pounds may be bought for 12l 5s?
Anſwer 14

23. If 15 pounds of raiſins coſt 5l 18s 1½d, what will 108 pounds coſt?
Anſwer £42 10 6

24. Suppoſe I gave 42l 10s 6d for 108 pounds of raiſins, how many pounds of the ſame can I buy for 5l 18s 1½d?
Anſwer 15

25. If 18 yards of ſilk damaſk coſt 17l 19s 7½d, what will 48 yards coſt? Anſwer £47 19 0

26. If 47l 19s pay for 48 yards of ſilk, how many yards will 17l 19s 7½d pay for? Anſwer 18

27. If 21 ells of holland coſt 5l 18s 1½d, what will 72 ells coſt? Anſwer £20 5

28. Suppoſe I gave 20l 5s for 72 ells of holland, how many ells can I have for 5l 18s 1½d? Anſ. 21

29. If 27 pair of ſilk gloves coſt 8l 0s 10½d, what will 81 pair coſt? Anſwer £24 2 7½

30. If 81 pair of gloves coſt 24l 2s 7½d, how many pair can I buy for 8l 0s 10½d? Anſwer 27

31. If 45 dozen of claret wine coſt 73l 2s 6d, what will 120 dozen coſt? Anſwer £195

32. If 120 dozen of claret wine coſt 195l, how many dozen can I buy for 73l 2s 6d? Anſwer 45

33. If 56 quarters of barley coſt 63l, what will 144 quarters coſt? Anſwer £162

34. If 144 quarters of barley coſt 162l, how many quarters can I buy for 63l? Anſwer 56

35. If 72 gallons of Burton ale coſt 6l, what will 25 hogſheads, London meaſure, come to? Anſ. £112 10

36. If 25 hogſheads of ale coſt 112l 10s, how many gallons of the ſame can I buy for 6l? Anſ. 72

37. If 77 groſs of buttons coſt 12l 5s 5¼d, what will 144 groſs coſt? Anſwer £22 19

38. If 144 groſs of buttons coſt 22l 19s, how many groſs can I buy for 12l 5s 5¼d? Anſwer 77

39. If 81 pounds of tobacco coſt 6l, how much can I buy for 15l 10s? Anſwer 209¼lb

40. If 209¼ pounds of tobacco coſt 15l 10s, what will 81 pounds coſt? Anſwer £6

41. If 70 yards of cloth coſt 78l 15s, how many yards may be bought for 38l 5s? Anſwer 34

42. If 34 yards of cloth coſt 38l 5s, what will 70 yards coſt? Anſwer £78 15

43. If 7½ yards coſt 17s 6d, what will 515 yards coſt? Anſwer £60 1 8

44. If 515 yards coſt 60l 1s 8d, how many yards may be bought for 17s 6d? Anſwer 7½yds.

45. If 3 ounces, 10 pennyweights of ſilver plate coſt 1l 1s 10½d, what will 655 ounces, 4 pennyweights, 16 grains coſt? Anſwer £204 15 2½

46. If 655 ounces, 4 pennyweights, 16 grains of ſilver coſt 204l 15s 2½d, how many ounces may be bought for 1l 1s 10½d? Anſwer 3oz. 10dwt.

47. If 2 hogſheads, 19½ gallons of brandy coſt 93l 1s 2¼d, what will 12 pipes, 1 hogſhead, 36 gallons coſt?

Anſwer £1030 7 4½

48. If 12 pipes, 1 hogſhead, 36 gallons of brandy coſt 1030l 7s 4½d, how many hogſheads may be bought for 93l 1s 2¼d? Anſwer 2hhds. 19½gal.

49. If 16½ pounds of raiſins coſt 8s 11¼d, what will 10 caſks coſt, each 5 hundred, 2 quarters, 18 pounds?

Anſwer £171 14 2

50. If 10 caſks of raiſins, each weighing 5 hundred weight, 2 quarters, 18 pounds, coſt 171l 14s 2d, how many pounds may be bought for 8s 11¼d? Anſ. 16½

51. If 1 hundred weight, 3 quarters, 13 pounds, 4 ounces of tobacco coſt 15l 10s, what will 9 hogſheads coſt, each weighing 8 hundred weight, 1 quarter, 12 pounds?

Anſwer £624 0 0

52. If 9 hogſheads of tobacco, each weighing 8 hundred weight, 1 quarter, 12 pounds, coſt 624l, how many pounds can I buy for 15l 10s? Anſwer C.1 3 13 4

53. If 4 hundred, 2 quarters, 6 pounds, 8 ounces of ſugar coſt 24l 16s 8¼d, what will 5 hogſheads coſt, each weighing net 8 hundred, 3 quarters, 6 pounds, 4 ounces?

Anſwer £239 17 9¾ $\frac{5340}{8168}$

54. If 5 hogſheads of ſugar, each weighing 8 hundred, 3 quarters, 6 pounds, 4 ounces coſt 239l 17s 9¾d $\frac{5340}{8168}$, how much can I buy for 24l 16s 8¼d? Anſ. 8168 oz.

55. If 252 gallons of wine coſt 50l 8s 6¾d, what will 12 tons, 3 hogſheads, 46 gallons coſt?

Anſwer £652 3 3¼ $\frac{45}{252}$

56. If 12 tons, 3 hogſheads, 46 gallons of wine coſt 652l 3s 3¼d $\frac{45}{252}$, how many gallons can I have for 50l 8s 6¾d?

Anſwer 252

57. Suppoſe I gave 69l 18s 7d for 1 hundred weight, 1 quarter, 7 pounds, 4 ounces of tea, what weight can I have for 560l 10s 4¼d? Anſwer C.10 2 4 4 $\frac{33844}{67132}$

58.

58. If 10 hundred, 2 quarters, 4 pounds, 4 ounces $\frac{35844}{67132}$ of tea coſt 560l 10s $4\frac{1}{4}$d, what will 1 hundred weight, 1 quarter, 7 pounds, 4 ounces of the ſame coſt?

Anſ. £69 18 7

59. A draper bought of a merchant 24 packs of cloth, each pack had 24 parcels, each parcel contained 40 pieces, and each piece 120 yards; he gave at the rate of 8l 17s $6\frac{3}{4}$d for every 24 yards; I deſire to know what the 24 packs coſt him? Anſ. £1022760 0 0

60. A merchant bought 24 packs of cloth, which coſt him 1022760l, each pack contained 24 parcels, each parcel 40 pieces, and each piece 120 yards; I deſire to know how many yards of the ſaid cloth I can buy for 8l 17s $6\frac{3}{4}$d, at prime coſt? Anſ. 24 yards

61. If 43 pounds, 6 ounces, 3 drams of copper coſt 2l 5s $1\frac{1}{4}$d, how much will 4 tons, 6 hundred weight, 2 quarters, 4 pounds, 6 ounces coſt? Anſ. £503 16 $0\frac{1}{2}$d $\frac{1370}{11107}$

62. If 4 tons, 6 hundred weight, 2 quarters, 4 pounds, 6 ounces of copper coſt 503l 16s $0\frac{1}{2}$d $\frac{1370}{11107}$, what quantity can I buy for 2l 5s $1\frac{1}{4}$d? Anſ. 11107 drams

63. A grocer bought 16 hundred weight, 2 quarters, 14 pounds weight of cloves, which coſt him 240l 2s, and he would gain 42l by the bargain, at what rate muſt he ſell them at per pound? Anſ. 3s $0\frac{1}{4}$d $\frac{826}{1862}$

64. If one pound weight of cloves coſt 3s $0\frac{1}{4}$d $\frac{826}{1862}$, what quantity of cloves at the ſame price can I buy for 282l 2s?

Anſ. C. 16 2 14

65. A merchant bought 72 tons of wine for 482l, the charges upon it amounted to 173l, and he would gain 260l by the whole; a gentleman came to him and demands the price of 12 tons, what muſt he give him? Anſ. £152 10 0

66. If 12 tons of wine coſt 152l 10s, how many tons of the ſame wine can be bought for 915l at the ſame rate?

Anſ. 72

67. Suppoſe I have by me 400 yards of broad cloth, which coſt me 180l, but ſome damage having happened to it, I am willing to loſe 15l by the whole: at what rate then muſt I ſell it per yard? Anſ. 8s 3d

68. If one yard of broad cloth coſt 8s 3d, how many yards can I buy for 165l? Anſ. 400

69. If 57 yards of yard-wide ſtuff exactly line 41 yards of ſilk of another breadth, how many yards of the latter

will line 552 pieces of the former, each piece being $85\frac{1}{2}$ yards? Anſ. 33948

70. If 33948 yards of yard-wide ſtuff line 552 pieces of ſilk of another breadth, each piece containing $85\frac{1}{2}$ yards, how many yards of the latter will line 41 yards of the former? Anſ. 57

71. Bought a quantity of holland, for which I gave 443l 6s 8d, how many pieces were there, each piece containing 28 Flemiſh ells, if one ell coſt me 3s 4d? Anſ. 95

72. If 95 pieces of holland coſt 443l 6s 8d, each piece containing 28 ells Flemiſh, I deſire to know how I muſt ſell it per ell? Anſ. 3s 4d

73. I have by me a piece of cloth which coſt 20l 16s $4\frac{1}{2}$d, how many yards doth it contain, the ell Engliſh being worth 9s $6\frac{3}{4}$d? Anſ. yds. 54 1 $2\frac{390}{459}$

74. If 54 yards, 1 quarter, $2\frac{390}{459}$ nails of cloth coſt 20l 16s $4\frac{1}{2}$d, how muſt I ſell it per ell Engliſh, ſo as to be no loſer by it? Anſ. 9s $6\frac{3}{4}$d

75. St. Martin's ſpire in Birmingham, at a certain time projected upon level ground, a ſhadow to the diſtance of 144 yards, 2 feet, 2 inches, when my cane, 3 feet 2 inches in length, perpendicularly erected, caſt a ſhadow of 6 feet 3 inches; from hence the height of the ſpire is required?

Anſ. yards 73 0 $11\frac{55}{75}$

76. The height of a certain ſteeple is 73 yards, 0 feet, $11\frac{55}{75}$ inches, and the length of its ſhadow at a certain time of the day is 144 yards, 2 feet, 2 inches; I deſire to know from hence how long the ſhadow of my cane will be at the ſame time, whoſe length is 3 feet 2 inches?

Anſ. 6 feet 3 inches

77. If the report of a cannon fired at a diſtance be heard $8\frac{1}{2}$ ſeconds of time after the flaſh is ſeen, how far off was the cannon fired? Anſ. 9707 feet

78. If the report of a cannon fired at the diſtance of 9707 feet be heard in $8\frac{1}{2}$ ſeconds of time after the flaſh is ſeen, in what time will the report be heard at the diſtance of 1142 feet? Anſ. 1 ſec.

79. Suppoſe I ſee a flaſh of lightning, and count 5 ſeconds before I hear the thunder, how far is the thunder cloud from me? Anſ. 1 mile 430 feet

80. Suppoſe a thunder cloud be 5710 feet from me, and hear the thunder in 5 ſeconds after I ſee the lightning,

in how many ſeconds of time ſhall I hear the thunder after I ſee the lightning, if the cloud be only 1142 feet from me?

Anſwer 1ſecond.

81. If 100l in twelve months gain 4l 10s intereſt, what will 96l 4s gain in the ſame time, at the ſame rate per cent?

Anſwer £4 6 $6\frac{1}{4}\frac{1680}{2000}$

82. If 96l 4s principal, in 12 months gain 4l 6s $6\frac{1}{4}\frac{1680}{2000}$d how much principal muſt I put to intereſt at the ſame rate and time, to gain 4l 10s? Anſwer 100l

83. Suppoſe I ſold goods to the value of 146l 10s to be paid in a year's time, what is the diſcount at $4\frac{1}{2}$ per cent?

Anſwer £6 6 $2\frac{140}{2090}$

84. If the diſcount of 146l 10s for a year at $4\frac{1}{2}$ per cent. be 6l 6s $2\frac{140}{2090}$d, I deſire to know the value of thoſe goods for which I was allowed 4l 10s diſcount, at the ſame rate and time? Anſwer £146 10

85. Suppoſe a bankrupt owes 25262l 12s $4\frac{1}{2}$d, and has in caſh, goods, and recoverable debts, 12631l 6s $2\frac{1}{4}$d, if theſe things are delivered to his creditors, what do they get in the pound? Anſwer 10s

86. Suppoſe a perſon fails in trade, and compounds with his creditors to pay them 10s in the pound, how much doth he owe when all his caſh, goods, and recoverable debts, amount only to 12631l 6s $2\frac{1}{4}$d? Anſ. £25262 12 $4\frac{1}{2}$

87. If a lever be 140 inches long, what weight, lying $12\frac{1}{2}$ inches from the end reſting on a pavement, may be moved with a force of 186lb. lifting at the other end of the lever? Anſwer $1897\frac{5}{25}$lb.

88. If a man lifting with the force of 186lb at the end of a lever, is able to move a weight of $1897\frac{5}{25}$ lb. fixed at the diſtance of $127\frac{1}{2}$ inches from his hand, the queſtion is, what diſtance the weight muſt be from the other end which meets with a convenient prop? Anſwer $12\frac{1}{2}$ inches

89. A perſon bought 864 eggs at 3 a penny, another ſort at 2 a penny, which together were ſold out for 2l 6s 4d, how many eggs were bought at 2 a penny? Anſ. 536

90. A perſon bought 536 eggs at 2 a penny, another ſort at 3 a penny, which together were ſold out at 2l 6s 4d, how many eggs were bought at 3 a penny? Anſ. 864

91. A may-pole 50 feet 11 inches high, at a certain time of the day, caſts a ſhadow 98 feet 6 inches long, I

would thereby find the heighth of a tower which at the ſame time throws the extremity of its ſhadow to the diſtance of 581 feet, 7 inches? Anſ. 300 ft. 7 $\frac{695}{1182}$ in.

92. A tower 300 feet 7 $\frac{695}{1181}$ inches high, at a certain time of the day caſt a ſhadow 581 feet, 7 inches long, I deſire to know from hence, how long the ſhadow of a may-pole will be at the ſame time, whoſe height is 50 feet 11 inches? Anſwer 98 ft. 6 inches

93. In the latitude of Birmingham, the diſtance round the earth meaſuring in the parallel of latitude, is about 15540 miles, now as the earth turns round in 23 hours, 56 minutes, at what rate per hour is the town of Birmingham carried by this motion, from weſt to eaſt?

Anſwer 649 $\frac{109}{359}$ miles

94. If the inhabitants of Birmingham, by the earth's motion, be carried 649 $\frac{109}{359}$ miles an hour, in how many hours will they be carried 1540 miles by this rotation?

Anſwer 23 hours 56 minutes

95. If the diameter of the moon be ſuppoſed 33′ 28″, and the deficient ſcruples at a lunar eclipſe, are found to be 29′ 28″, what are the digits eclipſed, allowing the whole to be 12 digits? Anſwer 10 dig. 33′ 56″ $\frac{164}{331}$

96. At a lunar eclipſe, it was found by obſervation, that the digits eclipſed were 10° 33′ 56″ $\frac{164}{231}$, and the deficient ſcruples 29′ 28″, from hence it is required to find the moon's diameter, allowing the whole to be 12 digits as before?

Anſwer 33′ 28″

97. A merchant ſent goods to Madeira to the value of 2290l 10s, to have returns from thence, the $\frac{1}{3}$ in ſugar at 1l 3s 3d per cwt. and the reſt in wine at 43l 16s a ton; how much of each of theſe goods muſt he receive to balance his adventure?

Anſwer 656 $\frac{216}{279}$ cwt. ſugar, and 34 $\frac{756}{876}$ tons, wine

98. A merchant received from Madeira goods to the amount of 2290l 10s, for $\frac{1}{3}$ of the money he received 656 $\frac{216}{279}$ cwt. of ſugar, and for the remainder 34 $\frac{756}{876}$ tons of wine; how much was the ſugar per cwt. and what was the wine per ton?

Anſwer 1l 3s 3d cwt. and 43l 16s per ton

99. In hunting a hare the gentlemen found that the hare had 120 hounds paces before the hound, and as often as the

hare runneth 16 paces, the hound runneth but 12 paces, but 4 paces of the hound's are as much as 6 of the hare's paces; how many paces muſt the hound run before he overtakes the hare? Anſwer 1080 paces

100. A gentleman hunteth a hare, and as often as the hound runneth 12 paces, the hare runneth 16, and 4 paces of the hound are equal to 6 of the hare, and the hound overtaketh the hare in 1080 of his own paces, how many hound's paces was the hare before him? Anſwer 120

THE RULE OF THREE INVERSE,

IS, when having three numbers given, and you are required to find a fourth, in the ſame proportion to the ſecond as the firſt has to the third.

RULE.—Multiply the firſt and ſecond terms together, and divide their product by the third, the quotient is the anſwer to the queſtion, in the ſame denomination you left the ſecond term in.

The method of proof is by inverting the queſtion.

EXAMPLES. (Pages 123—130)

Ex. 1. If 3 men can do a piece of work in 6 days, in how many days will 6 men do it?

M. *D.* *M.*	*D.* *M.* *D.*
3 : 6 :: 6	3 : 6 :: 6
3	3
6)18	6)18
3 days anſ.	3 men proof:

2. If 6 men do a piece of work in 3 days, how many men will do it in 6 days? Anſ. 3

3. If 18 men be 13 days in finiſhing a piece of work, in how many days will 24 men do it? Anſ. $22\frac{1}{2}$

4. If 24 workmen can finiſh a piece of work in $22\frac{1}{2}$ days, how many are ſufficient to do the ſame in 30 days? Anſ. 18

5. If a board be 5 inches broad, how many inches in length will make a ſquare foot? Anſ. $28\frac{4}{5}$

6. If a board 5 inches broad, take $28\frac{4}{5}$ inches long to make a ſquare foot, how many inches broad will make a ſquare foot if the length be 12 inches? Anſ. 12

7. How long muſt my friend lend me 162l for the uſe of 90l I lent him for 540 days? Anſ. 300 days

8. How many pounds muſt my friend lend me 540 days for the uſe of 162l I lent him 300 days? Anſ. 90l

9. If the penny loaf weighs 11 oz. 8 dwts. when wheat is 5s per buſhel, what muſt it weigh when wheat is 9s 6d per buſhel? Anſ. 6oz.

10. If the penny loaf weighs 6 oz. when wheat is 9s 6d per buſhel, how much is wheat per buſhel when the penny loaf weighs 11 oz. 8 dwts? Anſ. 5s

11. Proviſions in garriſon are found ſufficient to laſt 7200 ſoldiers for 8 months; but a reinforcement being wanted that the proviſions might laſt for 6 months only, what is the greateſt number of ſoldiers that can be added to the garriſon on that occaſion, to be continued for that time? Anſ. 2400

12. If 9600 men have proviſions to ſerve 6 months, how long will the ſame proviſions laſt 7200 men? Anſ. 8 months

13. If a paſture ſerves 48 horſes 18 weeks, how many horſes muſt be turned in to eat up the ſame in 8 weeks?
Anſ. 108 horſes

14. If a paſture ſerves 108 horſes 8 weeks, how many weeks will it ſerve 48 horſes? Anſ. 18 weeks

15. If 68 maſons built a fort in 14 days, to preſerve the ſoldiers from the enemy, how many men muſt be ſet to work to build the ſame in 4 days? Anſ. 238 maſons

16. If 238 men build a fortification in 4 days, in how many days will 68 men build it? Anſ. 14 days

17. How many yards of paper 27 inches wide, will hang a room that meaſures 69 feet round and 7 feet 3 inches high?
Anſ. 74 yds. 4 inches

18.

18. I deſire to know the height of that room whoſe circumference is 69 feet, and takes 74 yards 4 inches of paper, 27 inches wide, to hang it ? Anſ. 87 inches

19. Suppoſe 550 yards of cloth, 5 quarters wide, will make coats for 260 men, how many yards of ſhalloon, 3 qrs. wide, will line them ? Anſ. $916\frac{2}{3}$ yards

20. Suppoſe I have 550 yards of cloth, which takes $916\frac{2}{3}$ yards of ſhalloon, 3 quarters wide, to line it, I deſire to know its breadth ? Anſ. 5 qrs.

21. In what time will 1200l gain 100l intereſt, when 160l does it in 30 years ? Anſ. 4 years

22. If 1200l gain 100l intereſt in 4 years, how many pounds muſt I put out to gain the ſame in 30 years ? Anſ. 160l

23. Suppoſe 400l would defray the expences of 20 men for 87 weeks and 3 days, how long will 12 men be in ſpending the ſame ſum, at the ſame rate of living ? Anſ. 145 weeks 5 days

24. If 12 men ſpend 400l in 145 weeks 5 days, how many men will ſpend the ſame ſum in 87 weeks 3 days, they living at the ſame rate ? Anſ. 20 men

25. If one acre of land contains 20 perches in length and 8 in breadth, how many perches muſt there be in length when the breadth is only 3 perches ? Anſ. $53\frac{1}{3}$ per. in length

26. If $53\frac{1}{3}$ perches long and 3 broad, are contained in an acre of land, what muſt be the breadth when the length is 20 perches ? Anſ. 8 perches broad

27. Suppoſe I have a right of common for 200 ſheep 80 days, how long may I turn on 800 ſheep ? Anſ. 20 days

28. Suppoſe I have a right of common for 800 ſheep 20 days, how many ſheep may I turn on 80 days ? Anſ. 200

29. If a parcel of hay will keep 45 head of cattle 4 weeks, how long will it keep 30 head of cattle, feeding at the ſame rate? Anſ. 6 weeks

30. If a parcel of hay will keep 30 cattle 6 weeks, how many will eat the ſame quantity in 4 weeks ? Anſ. 45

31. How many yards of matting, that is 2 feet 6 inches wide, will cover a floor that is 18 feet long, and 16 feet 3 inches wide ? Anſ. 39 yards

32. What is the breadth of that floor whoſe length is 18 feet, and takes 39 yards of matting that is 2 feet 6 inches wide to cover it ? Anſ. 16 feet 3 inches

33. If for 40 ſhillings I have 15 cwt. 2 qrs. 8lb. carried 80 miles, how much weight can I have carried 60 miles for the ſame money? Anſ. 20 cwt. 3 qrs. $1\frac{1}{3}$lb.

34. If for 40 ſhillings I have 20 cwt. 3 qrs. $1\frac{1}{3}$lb. carried 60 miles, how many miles can I have 15 cwt. 2 qrs. 8lb. carried for the ſame money? Anſ. 80 miles

35. There is a veſſel, having a cock, which will empty it in 3 hours, I demand how many cocks of the ſame capacity there muſt be to empty the ſaid veſſel in $7\frac{1}{2}$ minutes?
Anſ. 24

36. There is a veſſel having 24 cocks, which will empty it in $7\frac{1}{2}$ minutes, in what time will one cock of the ſame capacity empty it? Anſ. 3 hours

37. What weight will a man be able to raiſe who preſſes with the force of a hundred and three quarters, on the end of an equipoiſed hand-ſpike 120 inches long, which is to meet with a convenient prop exactly 8 inches above the other end of the machine? Anſ. 2744lb

38. How long muſt the lever be if a man that preſſes with a force of $1\frac{3}{4}$ cwt. is able to raiſe a weight of 2744lb. provided it meets with a convenient prop 8 inches above the other end of the lever? Anſ. 120 inches long

39. There are two equal parallelograms, the length of one is 9 feet 6 inches, and its breadth 5 feet 2 inches; the breadth of the other is 3 feet 4 inches; what is its length?
Anſ. 14 feet $8\frac{7}{10}$ inches

40. Two equal parallelograms given, the length of one is 14 feet $8\frac{7}{10}$ inches, and its breadth 3 feet 4 inches; the length of the other is 9 feet 6 inches; what is its breadth?
Anſ. 5 feet 2 inches

41. If a field will keep 9 horſes 7 weeks, how long will it keep 21 horſes? Anſ. 3 weeks

42. If a field will keep 21 horſes 3 weeks, how many horſes will eat up the ſame in 7 weeks? Anſ. 9 horſes

COMPOUND PROPORTION,

Teacheth how from 5, 7, 9, 11, &c. conditional terms given, to find a 6, 8, 10, 12, &c. term reſpectively.

RULE 1.—Place the terms of ſuppoſition one above another, in the firſt place, and the terms of demand one above another, in the third place.

2. Let that term be put in the ſecond place which is of the ſame denomination with the term ſought, uſing the ſecond term in common, for each of them.

3. The firſt and third term of every row will be of one name, and muſt be reduced to the ſame denomination.

4. Examine every row ſeparately, by ſaying, if the firſt term give the ſecond, does the third require more or leſs? If it requires *more*, mark the *leſs* extreme; but if *leſs*, mark the *greater* extreme.

5. Multiply all thoſe numbers together which are marked for a diviſor, and thoſe which are not marked for a dividend, and the quotient will be the anſwer ſought.

EXAMPLES. (Pages 131—143.)

Ex. 1. If 16 horſes eat up 9 buſhels of oats in 6 days, how many horſes would eat up 24 buſhels in 8 days?

$$\begin{array}{ccccc} B. & & H. & & B. \\ {}^{*}9 & — & 16 & — & 24 \\ 6d. & — & — & — & 8d.^{*} \end{array}$$

$$\begin{array}{r} 9 \\ 8 \\ \hline 72 \end{array} \qquad \begin{array}{r} 24 \\ 16 \\ \hline 384 \\ 6 \\ \hline \end{array}$$

$$72\left\{\begin{array}{r} 9)2304 \\ \hline 8)256 \\ \hline \end{array}\right.$$

32 Horſes, Anſ.

2. If 32 horſes eat up 24 buſhels of oats in 8 days, how many buſhels will 16 horſes eat in 6 days? Anſ. 9

3. If 24l pay 40 ſoldiers for working on a fortification 36 days, how much will pay an army, conſiſting of 1500 ſoldiers, for working on the ſame fortification 32 days?
Anſ. 800l

4. If 800l pay 1500 men for working on a fortification 32 days, how many men will 24l pay for working on the ſame fortification 36 days? Anſ. 40l

5. A deal merchant bought 9000 deals, of 14 feet long, and $2\frac{1}{2}$ inches thick, how many deals are they equivalent to, 12 feet long and $1\frac{1}{2}$ inch thick? Anſ. 17500

6. A deal merchant bought 17500 deals, 12 feet long and $1\frac{1}{2}$ inch thick, how many deals are they equivalent to, 14 feet long and $2\frac{1}{2}$ inches thick? Anſ. 9000

7. A garriſon, conſiſting of 12000 men, have bread to allow each man 15 ounces a day for 32 weeks; now ſuppoſe they are reduced to 10000 men, how much muſt they have a piece to laſt them 48 weeks? Anſ. 12 oz.

8. If a garriſon, conſiſting of 10000 men, have bread enough to allow each man 12 ounces a day for 48 weeks, how much muſt 12000 men have a piece per day to laſt them 32 weeks? Anſ. 15 oz.

9. If 36l be the wages of 27 men for 24 weeks, what will be the wages of 72 men for 48 weeks? Anſ. 192l

10. If 72 ſtudents ſpend 192l in 48 weeks, how much will ſerve 27 ſtudents 24 weeks? Anſ. 36l

11. If 100l at intereſt for 365 days gain 5l, how much will 144l gain at intereſt for 486 days?
Anſ. 9l 11s $8\frac{3}{4}\frac{137}{365}$d

12. If 144l at intereſt for 486 days gain 9l 11s $8\frac{3}{4}\frac{137}{365}$d, what will 100l gain in 365 days? Anſ. 5l

13. If 12 pennyworth of wine be ſufficient for 8 perſons at a meal, when wine is 6d per quart, how much wine at 4d per quart will be ſufficient for 40 perſons? Anſ. 40d

14. If 100l in 12 months gain 5l intereſt, what principal will gain 10l in 8 months? Anſ. 300l

15. If 300l in 8 months gain 10l intereſt, what principal will gain 5l in 12 months? Anſ. 100l

16. If 248 men in 5 days, each 11 hours long, dig out part of a canal of 7 degrees of hardneſs, 232 yards long, 4

wide, and 5 deep; in how many days of 9 hours long, will 24 men dig out a part of the ſaid canal, of 4 degrees of hardneſs, 337 yards long, 5 wide, and 4 deep?

Anſ. 267$\frac{1}{2}$ days

17. If 4 compoſitors, in 16 days, of 12 hours long each, can compoſe 14 ſheets, of 24 pages in each ſheet, 44 lines in a page, and 40 letters in a line, how many days, of 10 hours long each, will it take 9 compoſitors (all working together, at the ſame rate with the former, and on the ſame ſized letter) to compoſe a volume, or book, to be printed, conſiſting of 30 ſheets, 16 pages in a ſheet, 50 lines in a page, and 45 letters in a line?

Anſ. 15 $\frac{45}{77}$ days.

PRACTICE,

IS a contraction of the Rule of Three Direct, when the firſt term is an unit or one, and is of great uſe to merchants and tradeſmen, being a conciſe method of working moſt queſtions that occur in trade and buſineſs.

TABLES.

The even Parts of Money.

Of a Pound.			*Of two Shil.*			*Of a Shil.*			*Of a Penny.*		
s. d.			d.			d.			qrs.		
10 0	is	$\frac{1}{2}$	12	is	$\frac{1}{2}$	6	is	$\frac{1}{2}$	2	is	$\frac{1}{2}$
6 8	-	$\frac{1}{3}$	8	-	$\frac{1}{3}$	4	-	$\frac{1}{3}$	1	-	$\frac{1}{4}$
5 0	-	$\frac{1}{4}$	6	-	$\frac{1}{4}$	3	-	$\frac{1}{4}$			
4 0	-	$\frac{1}{5}$	4	-	$\frac{1}{6}$	2	-	$\frac{1}{6}$			
3 4	-	$\frac{1}{6}$	3	-	$\frac{1}{8}$	1$\frac{1}{2}$	-	$\frac{1}{8}$			
2 6	-	$\frac{1}{8}$	2	-	$\frac{1}{12}$	1	-	$\frac{1}{12}$			
2 0	-	$\frac{1}{10}$	1$\frac{1}{2}$	-	$\frac{1}{16}$						
1 8	-	$\frac{1}{12}$	1	-	$\frac{1}{24}$						
1 0	-	$\frac{1}{20}$									

Parts of a Shil. will ſerve for Parts of a Foot.

The

The even Parts of Weight.

Of a Ton.			*Of a Hundred.*					*Of ½ a Hund*			*Of ¼ a Hund.*		
C.			qrs.		lb.			lb.			lb.		
10	is	$\frac{1}{2}$	2	or	56	is	$\frac{1}{2}$	14	is	$\frac{1}{4}$	14	is	$\frac{1}{2}$
5	-	$\frac{1}{4}$	1	—	28	-	$\frac{1}{4}$	8	-	$\frac{1}{7}$	7	-	$\frac{1}{4}$
4	-	$\frac{1}{5}$	0	—	16	-	$\frac{1}{7}$	7	-	$\frac{1}{8}$	4	-	$\frac{1}{7}$
2½	-	$\frac{1}{8}$	0	—	14	-	$\frac{1}{8}$	3½	-	$\frac{1}{16}$	3½	-	$\frac{1}{8}$
2	-	$\frac{1}{10}$	0	—	8	-	$\frac{1}{14}$	2	-	$\frac{1}{28}$			
1	-	$\frac{1}{20}$	0	—	7	-	$\frac{1}{16}$	1	-	$\frac{1}{56}$			
			0	—	4	-	$\frac{1}{28}$						
			0	—	3½	-	$\frac{1}{32}$						
			0	—	2	-	$\frac{1}{56}$						
			0	—	1¾	-	$\frac{1}{64}$						

RULE I.

If the given price be an aliquot part of a penny, ſhilling, two ſhillings, or a pound, divide by the aliquot parts, and the quotient will be the anſwer in pence, ſhillings, or pounds, reſpectively.

EXAMPLES. (Page 144.)

Ex. 1. What will 1644 yards of tape come to at ¼d per yard?

By Proportion.

```
 4 | 1644 at ¼d.            1 : 0¼ :: 1644
   |                                     1
12 |  411                             ----
   |                               4)1644
2|0|  3|4   3d.                    ------
   |                               12)411
£. |  1 14 3 Ans.                  ------
                                 2|0)3|4   3d.
                                 -----------
                                 £ 1 14 3 Ans.
```

2. What will 2446 pounds of copperas come to at ½d per pound?
Anſ. £5 1 11

3. What will 1426 pounds come to at ¾d per pound?
Anſ. £4 9 1½

4. What will 1436 pounds of whiting come to at 1d per pound? Anſwer £5 19 8

5. What will 3224 ounces of tobacco come to at 1½d per ounce? Anſwer £20 3 0

6. What will 3640 yards of filletting come to at 2d per yard? Anſwer £30 6 8

7. What will 642 pounds of rice come to at 3d per pound? Anſwer £8 0 6

8. What will 3641 pounds of ſugar come to at 4d per pound? Anſwer £60 13 8

9. What will 341 pounds of raiſins come to at 6d per pound? Anſwer £8 10 6

10. If one pound of butter coſt 8d, what will 346 pounds coſt? Anſwer £28 16 8

11. How much muſt I pay for 842 pounds of coffee, at the rate of 2s per pound? Anſwer £84 4 0

12. What muſt be given for 480 yards of cloth, at 2s 6d per yard? Anſwer £60 0 0

13. What comes 962 ells of Iriſh cloth to at 3s 4d per ell? Anſwer £160 6 8

14. If one gallon of oil coſt 4s, what will 4060 gallons coſt? Anſwer £812 0 0

15. What will 120 yards come to at 5s per yard? Anſwer £30 0 0

16. If one ton of coals coſt 6s 8d, what will 904 tons coſt? Anſwer £301 6 8

17. What will 4116 yards of cloth come to at 10s per yard? Anſwer £2058 0 0

RULE II.

If the given price be no aliquot part of a penny, ſhilling, or pound, divide it into ſeveral aliquot parts of a penny, ſhilling, or pound, or of one another, and the ſum of the quotients belonging to each aliquot part is the anſwer required.

EXAMPLES. (Page 148.)

Ex. 18. What will 2800 pounds of whiting come to at 1¼d per pound?

d.

$1 = \frac{1}{12}$ | 2800 at $1\frac{1}{4}$d.

$\frac{1}{4} = \frac{1}{4}$ | 233 4d.

58 4d.

2|0 | 29|1 8

£. | 14 11 8 Anſ.

By Proportion.

1 : $1\frac{1}{4}$ :: 2800

4 5

5 4)14000

12)3500

2|0)29|1 8d.

£ 14 11 8d. Proof

19. What will 342 pounds of ſalt come to at $1\frac{3}{4}$d per pound? Anſwer £2 9 $10\frac{1}{2}$

20. If one ounce of tea coſt $2\frac{1}{4}$d, what will 94 ounces coſt? Anſwer 17s $7\frac{1}{2}$d

21. If one yard of tape coſt $2\frac{1}{2}$d, what will 342 yards coſt? Anſwer £3 11 3

22. What will 432 yards come to at $2\frac{3}{4}$d per yard? Anſwer 4 19 0

23. What will 482 ounces of coffee come to at $3\frac{1}{4}$d per ounce? Anſwer £6 10 $6\frac{1}{2}$

24. If one pound of copperas coſt $3\frac{1}{2}$d, what will 481 pounds coſt? Anſwer £7 0 $3\frac{1}{2}$

25. What comes 4120 pounds of currants to at $3\frac{3}{4}$d per pound? Anſwer £64 7 6

26. What will 640 yards of canvas come to at $4\frac{1}{4}$d per yard? Anſwer £11 6 8

27. What will 423 yards of matting come to at $4\frac{1}{2}$d per yard? Anſwer £7 18 $7\frac{1}{2}$

28. If one pound of ſugar coſt $4\frac{3}{4}$d, what will 246 pounds coſt? Anſwer £4 17 $4\frac{1}{2}$

29 If one pound of raiſins coſt 5d, what will 1412 pounds coſt? Anſwer £29 8 4

30. What will 2160 pounds of ſoap come to at $5\frac{1}{4}$d per pound? Anſwer £47 5 0

31. What will 3240 pounds of ſugar come to at $5\frac{1}{2}$d per pound? Anſwer £74 5 0

32. What will 2134 pounds of ſoap come to at $5\frac{3}{4}$d per pound? Anſwer £51 2 $6\frac{1}{2}$

33. If one pound of hops coſt $6\frac{1}{4}$d, what will 1204 pounds coſt at that rate? Anſwer £31 7 1

34.

34. What will 496 pounds come to at 6½d per pound?
Anſ. £13 8 8

35. What will 984 yards of ribbon come to at 6¾d per yard?
Anſ. £27 13 6

36. What will 842 pounds of candles come to at 7d per pound?
Anſ. £24 11 2

37. What will 436 ounces of tea come to at 7¼ per ounce?
Anſ. £13 3 5

38. What will 4160 dozen of tops come to at 7½d per dozen?
Anſ. £130 0 0

39. What will 896 dozen of buttons come to at 7¾d per dozen?
Anſ. £28 18 8

40. If 1 pound of candles coſt 8d, what will 4960 pounds coſt?
Anſ. £165 6 8

41. If 1 yard of lace coſt 8¼d, what will 960 yards coſt?
Anſ. £33 0 0

42. What will 842 yards of ribbon come to at 8½d per yard?
Anſ. £29 16 5

43. What will 123 pair of buckles come to at 8¾d per pair?
Anſ. £4 9 8¼

44. What will 842 pounds of ſugar come to at 9d per pound?
Anſ. £31 11 6

45. If 1 pound of butter coſt 9¼d, what will 786 pound coſt?
Anſ. £30 5 10½

46. What will 1212 pounds of ſaltpetre come to at 9½d per pound?
Anſ. £47 19 6

47. What will 644 pounds of cocoa come to at 9¾d per pound?
Anſ. £26 3 3

48. At 10d per pound, what comes 596 pounds to?
Anſ. £24 16 8

49. What will 742 yards of tammy come to at 10¼d per yard?
Anſ. £31 13 9½

50. What will 412 yards of blond lace come to at 10½d per yard?
Anſ. £18 0 6

51. What comes 680 pounds of logwood to at 10¾d per pound?
Anſ. £30 9 2

52. If 1 pound of butter coſt 11d, what will 1234 pounds coſt?
Anſ. £56 11 2

53. If 1 cream cheeſe coſt 11¼d, what will 3620 coſt?
Anſ. £169 13 9

54. What will 684 pounds of double refined ſugar come to at 11½d per pound? Anſ. £32 15 6

55. What will 962 pounds of hops come to at 11¾d per pound? Anſ. £47 1 11½

RULE III.

If there be ſhillings in the price, multiply the given quantity by the number of them, and for the odd money (if any) take the greateſt even part of a ſhilling, and for what is wanting take parts of that part, and add them together, the whole reduced into pounds is the anſwer.

EXAMPLES. (Page 160.)

Ex. 56. What will 642 yards of cloth come to at 1s 7d per yard?

```
d                                        By Proportion.
6 = 1/2 | 642 at 1s 7d          1 : 1  7 :: 642
1 = 1/6 | 321                       12        19
        |  53   6d                  --    --------
        | ---------                 19  12)12198
    2|0 | 101|6  6                         --------
        | ---------                     2|0)101|6  6d
     £. |  50  16  6 Anſ.                 ----------
        | ---------                     £50  16  6 Proof.
                                          ----------
```

57. What will 1241 dozen of lemons come to at 2s 5d per dozen? Anſ. £149 19 1

58. What will 468 hundred of Liſbon lemons come to at 3s 8d per hundred? Anſ. £89 2 0

59. What will 642 dozen of pomegranates come to at 4s 3d per dozen? Anſ. £136 8 6

60. What will 543 dozen of worſted ſtockings come to at 5s 11d per dozen? Anſ. £160 12 9

61. If a pair of ſilk gloves coſt 6s 10½d, what will 48 pair coſt? Anſ. £16 10 0

62. What will 412 gallons of lucca oil come to at 7s 7d per gallon? Anſ. £156 4 4

63. What will 141 yards of taffety come to at 8s 3¼d per yard? Anſ. £58 6 2¼

64. What will 364 yards of cloth come to at 9s 7½d per yard? Anſ. £175 3 6

65. What will 891 yards of muſlin come to at 10s 5¼d per yard? Anſ. £464 19 9¾

66. What will 401 yards of paduaſoy come to at 11s 9½d per yard? Anſ. £236 8 5½

67. What will 481 yards of broad cloth come to at 12s 8d per yard? Anſ. £304 12 8

68. If 1 dozen of red port wine coſt 13s 6d, what muſt be given for 801 dozen? Anſ. £540 13 6

69. What will 482 quarters of barley come to at 14s 8d per quarter? Anſ. £353 9 4

70. What will 321 quarters of malt come to at 15s 9d per quarter? Anſ. £252 15 9

71. What will 218 dozen of ſheep-ſkins come to at 16s 10d per dozen? Anſ. £183 9 8

72. What will 466 dozen of calf-ſkins come to at 17s 4d per dozen? Anſ. £403 17 4

73. What will 621 yards of cloth come to at 18s 6d per yard? Anſ. £574 8 6

74. What will 123 firkins of butter come to at 19s 10½d per firkin? Anſ. £122 4 7½

RULE IV.

If there be pounds in the price, multiply the given quantity by the number of them, and for the odd money find its produce by the former rules, and add them together for the anſwer.

EXAMPLES. (Page 167.)

Ex. 75. If 1 hundred weight of Malaga raiſins coſt 1l 10s, what will 112 cwt. coſt?

```
s.                                  By Proportion.
10 = ½ | 112 at 1l 10s        1 : 1   10 :: 112
       |  56                          20         30
       | ———                         ———       ————
     £ | 168 Anſ.                     30     2|0)336|0
       | ———                                   ————
                                              £ 168 Proof
                                               ————
```

76. What will 412 cwt. of currants come to at 1l 16s 7d per cwt? Anſ. £753 12 4

77. What will 244 hhds. of ſugar come to at 2l 10s per hhd? Anſ. £610 0 0

78. What will 321 cwt. of double refined ſugar come to at 3l 15s per cwt? Anſ. £1203 15 0

79. What will 412 hhds. of tobacco come to at 4l 16s per hhd? Anſ. £1977 12 0

80. What will 146 caſks of wine come to at 5l 6s 6½d per caſk? Anſ. £777 15 1

81. What will 432 hhds. of oil come to at 6l 7s 6d per hhd? Anſ. £2754 0 0

82. What will 96 anchors of brandy come to at 7l 15s per anchor? Anſ. £744 0 0

83. What will 100 hhds. of ale come to at 8l 16s 4d per hhd? Anſ. £881 13 4

84. If one tun of wine coſt 12l 10s, what will 220 tuns coſt? Anſ. £2750 0 0

85. What will 421 hhds. of ſugar come to at 17l 13s per hhd? Anſ. £7430 13 0

86. What will 48 pipes of wine come to at 18l 19s per pipe? Anſ. £909 12 0

RULE V.

If the price be any even number of ſhillings, multiply the quantity by half the number, doubling the firſt figure of the product for ſhillings, the reſt are pounds.

EXAMPLES. (Page 171.)

87. What will 124 pounds of tobacco come to at 2s per pound?

lb.
124 at 2*s.*
1
£ 12 8 Anſ.

Otherwiſe.
lb. *s.* *lb.*
1 : 2 :: 124
2
2|0) 24|8
£ 12 8 Proof.

88. What will 222 gallons of oil come to at 4s per gallon? Anſ. £44 8 0

89. What will 683 yards of cloth come to at 6s per yard? Anſ. £204 18 0

90. What will 482 ells of holland come to at 8s per ell? Anſ. £192 16 0

91. What will 422 groſs of buttons come to at 10s per groſs? Anſ. £211 0 0

92. What will 683 yards of ſilk come to at 12s per yard? Anſ. 409 16 0

93. What will 684 reams of paper come to at 14s per ream? Anſ. £478 16 0

94. What will 322 yards of broad cloth come to at 16s per yard? Anſ. £257 12 0

95. What will 344 ſheep come to at 18s per ſheep? Anſ. £309 12 0

96. What will 242 dozen of calf ſkins come to at 34s per dozen? Anſ. £411 8 0

97. Bought 364 hhds. of cyder at 56s per hhd. what did the whole lie me in? Anſ. 1019 4 0

98. Sold 482 cwt. of ſugar at 80s per cwt. what did the whole amount to? Anſ. 1928 0 0

99. What will 365 pair of ſilk ſtockings come to at 11s per pair? Anſ. £200 15 0

100. What muſt be given for 246 pounds of tea, at the rate of 17s per pound? Anſ. £209 2 0

101. If one ton of coals coſt 6s 8d, what will 690 tons coſt? Anſ. £230 0 0

RULE VI.

When the given quantity conſiſts of ſeveral denominations, value the whole numbers by ſome of the former rules, and for the odd weight or meaſure, take parts of the given price and add them together.

Or when the given quantity is not very large, multiply the price by the number of integers, and take parts for the odd weight or meaſure, and add them together for the anſwer.

EXAMPLES. (Page 173.)

Ex. 102. What will 4 cwt. 1 quarter of raiſins come to at 1l 5s per cwt.

qr. lb.	*£. s.*
1 0 = ¼	1 5 at 1*l* 5*s*
	4
	5 0
	0 6 3
£.	5 6 3 Anſ.

Otherwiſe.

qr.	*£. s.*
1 = ¼	1 5
	0 6 3
s.	*cwt.*
5 = ¼	4
	1
	0 6 3
£.	5 6 3 Proof.

103. Bought 3 cwt, 2 qrs, 14lbs of cheeſe, at 2l 6s 4d per cwt, what did the whole lie me in? Anſ. £8 7 $11\frac{1}{2}$

104. What will 72 cwt, 3 qrs, 21lbs of ſugar come to at 6l 16s per cwt? Anſ. £495 19 6

105. What will 37 cwt, 3 qrs, 21lbs of tobacco come to at 6l 16s per cwt? Anſ. £257 19 6

106. What will the freight of 113 tons, 18 cwt, 3 qrs of indigo amount to at 19l 19s per ton? Anſ. £2273 1 $0\frac{3}{4}$

107. What is the value of 2 qrs, 21lbs of double refined ſugar at 3l 5s 4d per cwt? Anſ. £2 4 11

108. Bought 17 pounds of indigo at 6l 10s 8d per cwt, what doth it come to? Anſ. 19s 10d

109. What will 781 cwt, 3 qrs, 4lbs of ſugar come to at 1l 17s 4d per cwt? Anſ. £1459 6 8

110. What coſt the freight of 542 tons, 15 cwt, at 6l 16s $4\frac{1}{2}$d per ton? Anſ. £3700 17 $6\frac{11}{4}$

111. What will 12 pounds, 10 ounces, 15 dwts, 12 grs of ſilver come to at 3l 6s per pound? Anſ. £42 11 3 $0\frac{2}{3}$ qrs.

112. What is the rent of 1426 acres, 3 roods, 20 perches of land, at 3l 17s 6d per acre? Anſ. £5529 2 9

RULE VII.

If the given quantity hath a fraction annexed, value the whole number as before, and for the fraction, multiply the price by the numerator, and divide that product by the denominator; the quotient is the value of the fraction, and muſt be added to the value of the whole number.

EXAMPLES. (Page 176.)

Ex. 113. What will $716\frac{3}{8}$ ells of holland come to at 6s 11d per ell?

d.
6 = $\frac{1}{2}$ | $716\frac{3}{8}$
| 6
| 4296
3 = $\frac{1}{2}$ | 358
$1\frac{1}{2}$ = $\frac{1}{2}$ | 179
$\frac{1}{2}$ = $\frac{1}{3}$ | 89 6*d*
| 29 10
| 2 $7\frac{1}{8}$
2|0 | 495|4 $11\frac{1}{8}$*d*
£. | 247 14 $11\frac{1}{8}$ Anſ.

s. *d.*
6 11
3
8)1 0 9
£0 2 $7\frac{1}{8}$

114. What will $265\frac{3}{4}$ yards of cloth come to at 14s per yard? Anſ. £186 0 6

115. What will $358\frac{3}{8}$ yards of broad cloth come to at 17s per yard? Anſ. £304 12 $4\frac{1}{2}$

116. What will $964\frac{5}{8}$ yards come to at 8s $10\frac{1}{2}$d per yard? Anſ. £428 1 $0\frac{12}{28}$

117. What will $186\frac{3}{5}$ ells come to at 1l 12s $6\frac{1}{2}$d per ell? Anſ. £303 12 $3\frac{11}{45}$

RULE VIII.

When the price hath a fraction annexed, work for the pounds, ſhillings, or pence by the ſhorteſt of the foregoing rules, and for the fraction multiply the given quantity by the numerator, and divide that product by the denominator, which quotient add to the ſum of the whole number for the anſwer.

EXAMPLES.

EXAMPLES. (Page 177.)

118. What will 908 pounds of tobacco come to at $19\frac{5}{8}$d per pound?

lb.
908 at $19\frac{5}{8}d$
19
17252
567 $\frac{1}{2}$
12)17819 $\frac{1}{2}$
2|0)148|4 11
£74 4 $11\frac{1}{2}$ Anſ.

908
5
8)4540
567 $\frac{4}{8}$ or $\frac{1}{2}d$

119. How much ſterling muſt I give for 784 French crowns, at $5\frac{3}{9}$s per crown? Anſwer £209 1 4

120. What will the carriage of 8372 pounds come to at $\frac{7}{8}$ of a penny per pound? Anſwer £30 10 $5\frac{1}{2}$

121. What will 423 yards of tape come to at $\frac{4}{5}$ of a penny per yard? Anſwer £1 8 $2\frac{2}{5}$

RULE IX.

When the given quantity is feet, inches, &c. multiply the length by the number of feet in the breadth, and take aliquot parts for the inches, &c. according to the foregoing rules, and add them together for the anſwer.

EXAMPLES. (Page 178.)

Ex. 1. What is the product of 6 feet 6 inches, by 3 feet 2 inches?

I.	F.	I.		F.	I.
$2 = \frac{1}{6}$	6	6	by	3	2
		3			
	19	6			
	1	1			
	20	7 Anſ.			

By Duodecimals.

F.	I.	
6	6	
3	2	
19	6	
1	1	0
20	7	0

2. What is the product of 8 feet 4 inches, by 5 feet 3 inches? Anſwer 43 ft, 9 inches

3. What is the product of 12 feet 6 inches, by 8 feet 5 inches? Anſwer 105 ft, 2 6

4. A floor is 26 feet 4 inches long, and 12 feet 7 inches broad, how many ſquare feet does it contain?
Anſwer 331 ft, 4 4

5. How many ſquare feet are there in a room, the length of which is 76 feet 6 inches, and breadth 48 feet 3 inches?
Anſwer 3691 ft, 1 6

6. If a room be 45 feet 6 inches long, and 38 ft 7 inches broad, how many ſquare feet does it contain?
Anſwer 1755 ft, 6 6

7. What is the area in ſquare feet of a room, the length of which is 84 feet 2 inches, and breadth 79 feet 2 inches?
Anſwer 6663 ft, 2 4

8. A partition is 126 feet 6 inches long, and 121 feet 3 inches broad, how many ſquare feet will it contain?
Anſwer 15338 ft, 1 6

9. If a court be 764 feet 5 inches long, and 192 feet 4 inches broad, how many ſquare feet will it contain?
Anſwer 147022 ft, 9 8

10. How many ſquare feet are there in a bowling-green, the length of which is 7681 feet 8 inches, and breadth 1926 feet 10 inches? Anſwer 14801291 ft, 4 8

11. If a window be 7 feet, 3 inches, 3 parts long, and 1 foot, 7 inches, 6 parts broad, how many ſquare feet of glaſs does it contain? Anſwer 11 ft, 9 9 4 6

12. How many ſquare feet of glaſs are there in a window, the length of which is 8 feet, 6 inches, 6 parts, and breadth 7 feet, 3 inches, and 4 parts? Anſwer 62 ft, 1 11 8

13. If a piece of wainſcot be 4 feet, 10 inches, 6 parts long, and 2 feet, 4 inches, and 8 parts broad, how many ſquare feet are contained therein; Anſwer 11 ft, 7 9

14. How many ſquare feet of painting are there in a partition, the length of which is 7 feet, 8 inches, 6 parts, and breadth 7 feet, 2 inches, and 8 parts?
Anſwer 55 ft, 8 0 8

15. What is the content of a table in ſquare feet that is 3 feet 6¼ inches long, and 2 feet 4½ inches broad?
Anſwer 8 ft, 4 4 1 6

16.

16. How many ſquare feet are contained in a partition that meaſures 12 feet, 2 inches, and 10 parts long, and 9 feet, 6 inches, and 4 parts broad? Anſwer 116 ft, 6 11 11 4

17. What is the area, in ſquare feet, of a room that is 76 feet, 3 inches, 3 parts long, and 84 feet, 7 inches, 6 parts broad? Anſwer 6454 ft, 5 0 4 6

18. How many ſquare feet are there in a wall 87 feet, 3 inches, and 5 parts long, and 18 feet, 1 inch, 6 parts high?

Anſwer 1580 ft, 0 5 1 6

19. If a court yard be 371 feet $2\frac{1}{4}$ inches long, and 181 feet $1\frac{1}{4}$ inches broad, how many ſquare feet doth it contain?

Anſwer 67223 ft, 7 2 9 9

20. How many ſquare feet are contained in a garden, the length of which is 487 feet, 10 inches, and 10 parts, and breadth 186 feet $5\frac{1}{2}$ inches?

Anſwer 90973 ft, 6 5 7

21. What is the ſuperficial content of a board, the length of which is 18 feet 6 inches, and breadth 1 foot 2 inches?

Anſwer 21 ft, 7

22. If a garden wall be 45 feet 6 inches round, and 9 feet 4 inches high, how many ſquare feet doth it contain?

Anſ. 424 ft, 8

23. How many ſquare yards of paving are there in a court yard, the length of which is 64 feet 6 inches, and breadth 47 feet 8 inches? Anſ. 341 yards, 5 6

24. How many ſquare yards of paving are there in a ſtreet, the length of which is 864 feet 3 inches, and breadth 62 feet 6 inches? Anſ. 6001 yds, 6 7 6

25. If a ceiling be 60 feet 9 inches long, and 22 feet 3 inches broad, how many yards doth it contain?

Anſ. 150 yds, 1 8 3

26. How many ſquare yards of painting are contained in a room that meaſures 40 feet 6 inches in circumference, and 9 feet 3 inches high? Anſ. 41 yds, 5 7 6

27. If a window be 3 feet, 8 inches, 9 parts long, and 1 foot, 4 inches, 6 parts broad, how many ſquare feet of glaſs are contained therein? Anſ. 5 ft, 1 6 4 6

28. Suppoſe there was a window with 15 panes of glaſs, each 3 feet $7\frac{3}{4}$ inches long, and 1 foot, 5 inches, 1 part broad, how many feet of glaſs doth it contain?

Anſ. 77 ft, 10 2 11 3

29. How many ſolid feet are there in a beam that is 1 foot 6 inches broad, 1 foot 3 inches deep, and length 16 feet 3 inches? Anſ. 30 ft, 5 7 6

30. If a beam be 1 foot, 5 inches, 6 parts, by 1 foot, 2 inches, 10 parts, and length 12 feet, 3 inches, 7 parts, how many ſolid feet doth it contain? Anſ. 22 ft, 2 0 6 2 1

TARE AND TRET.

BY theſe Rules merchants and tradeſmen deduct certain allowances made by them in ſelling their goods by weight.

Tare is an allowance made to the buyer, for the weight of the box, barrel, bag, &c. which contains the goods bought.

Tret is an allowance of four pounds in every 104 pounds for waſte, duſt, &c.

Cloff is an allowance of two pounds for every 3 cwt.

Gross Weight is the whole weight of any ſort of goods, together with the box, barrel, bag, &c. that contains them.

Suttle is when part of the allowance is deducted from the groſs.

Nit-Weight is what remains after all allowances are made.

CASE I.

When the tare is at ſo much per box, barrel, bag, &c.

RULE.

Multiply the number of boxes or barrels, &c. by the Tare, and ſubtract the product from the groſs, the remainder is the net weight required.

EXAMPLES.

EXAMPLES. (Page 185.)

Ex. 1. Suppoſe 6 cwt, 1 quarter, 7 pounds tare was allowed on 97 cwt, 1 quarter, 8 pounds of raiſins, what is the net weight?

	C.	*qr.*	*lb.*	
Groſs	97	1	8	
Tare	6	1	7	
Net weight	91	0	1	Anſ.
	97	1	8	Proof.

2. What is the net weight of 8 hogſheads of tobacco, each weighing 9 cwt, 2 quarters, 8 pounds groſs, tare 14 pounds per hhd? Anſ. 75 cwt, 2 qrs, 8lb

3. In 14 frails of raiſins, each weighing 5 cwt, 2 qrs, 5 pounds groſs, tare 23 pounds per frail, how much net?

Anſ. 74 cwt, 3 qrs

4. In 24 barrels of figs, each weighing 1 cwt, 3 qrs, 10 pounds groſs, tare 10lb per barrel, how much net?

Anſ. 42 cwt

5. What is the net weight of 20 bales of ſilk, each weighing 1 cwt, 2 qrs, 13lb groſs, tare 18 pounds per bale?

Anſ. 29 cwt, 12lb

CASE II.

When the tare is at ſo much per hundred weight.

RULE.

Divide the groſs weight by the aliquot parts of a cwt, and ſubtract the quotient from the groſs, the remainder is the net weight.

EXAMPLES. (Page 186.)

Ex. 6. What is the net weight of 6 barrels of figs, each weighing 4 cwt, 2 quarters, 6 pounds groſs, tare 14 pounds per cwt?

	C.	*qr.*	*lb.*	
	4	2	6	
			6	
$14 = \frac{1}{8}$	27	1	8	groſs
	3	1	18	tare
Anſwer	23	3	18	net weight.

7. What is the net weight of 127 hundred weight, 3 quarters, 14 pounds groſs, tare 16 pounds per cwt ?
Anſ. 109 cwt. 2 qrs. 12lb.

8. What is the net weight of 36 bags of cinnamon, each weighing 2 cwt. 1 qr. 5 pounds groſs, tare 7 pounds per cwt ?
Anſ. 77 cwt. 1 qr. 21¾lb.

9. What is the net weight of 3 barrels of indigo, each 7 cwt. groſs, tare 10½ pounds per cwt ?
Anſ. 19 cwt. 0 qr. 3½lb.

10. What is the net weight of 16 hogſheads of tobacco, ach weighing 5 cwt. 2 qrs. 4 pounds groſs, tare 21 pounds per cwt ?
Anſ. 71 cwt. 3 qrs. 24lb.

CASE III.

When tret is allowed with tare.

RULE.

Divide the ſuttle weight by 26, as in compound diviſion, nd the quotient is the tret, which ſubtract from the ſuttle, he remainder is the net.

EXAMPLES. (Page 188.)

Ex. 11. If 20 cwt. 1 qr. 4 pounds groſs, tare 35 pounds er cwt. tret 4 pounds per 104 as uſual, what is the net eight ?

lb.	*C.*	*qr.*	*lb.*	
28=$\frac{1}{4}$	20	1	4	groſs
7=$\frac{1}{4}$	5	0	8	
	1	1	2	
	6	1	10	tare
* 26	13	3	22	ſuttle
	0	2	$4\frac{1}{13}$	tret
Anſ.	13	1	$17\frac{12}{13}$	net wt.

* 104÷4=26

12. What is the net weight of a puncheon of prunes, groſs weight 6 cwt. 2 qrs. 24 pounds, tare 14 pounds per cwt. tret as uſual? Anſ. 5 cwt. 2 qrs. $16\frac{9}{13}$lb.

13. Suppoſe a merchant buys 12 hogſheads of tobacco, each weighing 9 cwt. 1 qr. 14 pounds groſs, tare 21 pounds per cwt. tret as uſual, how much net?

Anſ. 87 cwt. 3 qrs. $15\frac{3}{4}$lb.

14. In 8 bags of cotton yarn, each weighing 4 cwt. 2 qrs. 7 pounds groſs, tare 24 pounds per cwt. tret as uſual, how much net weight? Anſ. 27 cwt. 2 qrs. $8\frac{6}{13}$lb.

15. In 28 barrels of indigo, each weighing 2 cwt. 3 qrs. 14 pounds groſs, tare $24\frac{1}{2}$ pounds per cwt. tret 4 pounds per 104 as uſual, how much net weight?

Anſ. 60 cwt. 1 qr. $24\frac{3}{4}\ \frac{9}{26}$lb.

CASE IV.

When tare, tret, and cloff are all allowed.

RULE.

Deduct the tare and tret, and divide the ſuttle by 168, the quotient is the cloff, which ſubtract from the ſuttle, the remainder is the net.

EXAMPLES.

EXAMPLES. (Page 189.)

Ex. 16. What is the net weight of 32 cwt. 3 qrs. 12 pounds groſs, tare 14 pounds per cwt. tret 4 pounds per 104 pounds, and cloff 2 pounds for 3 cwt?

lb.	*C.*	*qr.*	*lb.*		
14 = $\frac{1}{8}$	32	3	12		groſs
	4	0	12		tare
26	28	3	0		ſuttle
	1	0	11	13	tret
168	27	2	16	3	ſuttle
	0	0	18	6	cloff
Anſwer	27	1	25	13	net weight

17. What is the net weight of 64 cwt. 3 qrs. groſs, tare 8 pounds per cwt. tret and cloff as uſual?

Anſ. 50 cwt. 1 qr. 24lb. 7$\frac{1}{3}$ ounces

18. In 36 cheſts of ſugar, each weighing 12 cwt. 1 qr. 16 pounds groſs, tare 21 pounds per cwt. tret and cloff as uſual, how much net weight?

Anſ. 346 cwt. 1 qr. 25$\frac{15}{28}$ lb.

19. A merchant buys 6 hogſheads of tobacco, each containing 9 cwt. 1 qr. 14 pounds groſs, tare 3 qrs. 18 pounds per hogſhead, tret and cloff as uſual, how much net weight?

Anſ. 48 cwt. 2 qrs. 4lb. 12 ounces

20. In 28 cwt. 2 qrs. groſs weight of currants, how much net, allowing 18 pounds per cwt. tare, 4 pounds, 104 tret, and 2 pounds per 3 cwt. cloff?

Anſ. 22 cwt. 3 qrs. 12$\frac{2}{3}$lb.

SIMPLE INTEREST,

IS a premium allowed by the borrower of money to the lender; *principal* is the money lent; *rate* is the ſum per cent. agreed on, which ſhould not exceed 5l. for the uſe of one hundred pounds for one year; *amount* is the principal and intereſt added together.

RULE.

1. Multiply the principal by the rate, and divide that product by one hundred, the quotient is the anſwer for one year.

2. Multiply the intereſt for one year by the time given; the product is the anſwer for that time.

3. If there is a part of a year, as months or days, find for the even time as before, and for the odd time take ſome aliquot part or parts of a year; or if that cannot be done, work by the Rule of Three Direct.

EXAMPLES. (Page 191.)

Ex. 1. What is the intereſt of 364l for one year, at 5l per cent. per annum?

$$\begin{array}{r} 364 \\ 5 \\ \hline £\ 18|20 \\ 20 \\ \hline s.\ 4|00 \\ \hline \text{Anſ. } £\ 18\ \ 4 \\ \hline \end{array}$$

2. What is the intereſt of 364l for one year, at $4\frac{1}{2}$l per cent. per annum? Anſ. £16 7 $7\frac{1}{5}$

3. What is the intereſt of 364l for one year, at 4l per cent. per annum? Anſ. £14 11 $2\frac{1}{4}$ $\frac{3}{5}$

4. What is the intereſt of 500l 10s 6$\frac{1}{4}$d for one year, at 5l per cent per annum? Anſ. £25 0 6$\frac{1}{4}$ $\frac{1}{4}$qr

5. What is the intereſt of 862l 16s 8d for one year, at 4$\frac{1}{2}$l per cent per annum? Anſ. £38 16 6$\frac{1}{2}$ $\frac{2}{5}$

6. What is the intereſt of 1000l 16s 8d for one year, at 4l per cent per annum? Anſ. £40 0 8

7. What is the intereſt of 486l for 5 years, at 5l per cent per annum? Anſ. £121 10 0

8. What is the amount of 884l for 7 years, at 5l per cent per annum? Anſ. £1193 8 0

9. What is the amount of 1001l for 6 years, at 4$\frac{1}{2}$l per cent per annum? Anſ. £1271 5 4 $\frac{4}{5}$

10. What is the amount of 460l for 4 years, at 3$\frac{3}{4}$l per cent per annum? Anſ. £529 0 0

11. What is the intereſt of 924l for two months, at 5l per cent per annum? Anſ. £7 14 0

12. What is the intereſt of 1205l for 6 months, at 4l per cent per annum? Anſ. £24 2 0

13. What is the amount of 640l 8s 4d for 7 years, at 5l per cent per annum? Anſ. £864 11 3

14. What is the amount of 9640l 16s 8d for 4 years and 9 months, at 5l per cent per annum?
Anſ. £11930 10 7$\frac{1}{2}$

15. Lent a friend 20l for 13 weeks, what will it amount to at 5l per cent per annum? Anſ. £20 5 0

16. What is the amount of 500l for 4 years and 39 weeks, at 5l per cent per annum? Anſ. £618 15 0

17. What is the intereſt of 641l for 50 days, at 5l per cent per annum? Anſ. £4 7 9$\frac{1}{2}$ $\frac{290}{365}$

18. What is the intereſt of 2000l for 63 days, at 4$\frac{1}{2}$l per cent per annum? Anſ. £15 10 8 $\frac{16}{73}$

19. What is the amount of 5800l 16s 8d for 260 days, at 4l per cent per annum? Anſ. £5966 2 4 $\frac{12}{73}$

20. What is the intereſt of 563l 12s 6$\frac{1}{2}$d for 265 days, at 5l per cent per annum? Anſ. £20 9 2$\frac{1}{2}$ $\frac{13}{73}$

COMMISSION,

IS an allowance made to factors or agents abroad, for buying or ſelling of goods for their employers.

EXAMPLES. (Page 198.)

Ex. 1. What is the commiſſion of 500l at 2½l per cent?

Anſ. £12 10 0

2. Suppoſe I allow my correſpondent two per cent for his commiſſion, what is his demand on the diſburſement of 369l?

Anſ. £7 7 7 ⅓

3. What muſt I allow my factor for the diſburſing on my account 748l 11s 8d, at 3 per cent?

Anſ. £22 9 1¾ ⅓

4. What is the commiſſion on 1900l at 5⅞ per cent?

Anſ. £111 12 6

BROKAGE,

IS an allowance of ſo much per cent made to brokers for aſſiſting others in buying or diſpoſing of their goods.

EXAMPLES. (Page 199.)

Ex. 1. What is the brokage of 640l at 5s or ¼ per cent?

Anſwer £1 12 0

2. What is the brokage of 845l at 10s or ½ per cent?

Anſwer £4 4 6

3. If I allow my broker 2½ per cent, what may he demand when he ſells goods to the value of 202l 1s 8d?

Anſwer £5 1 0½

4. What is the brokage of 4360l 8s 4d at 3 per cent?

Anſwer £130 16 3

5. What is the brokage of 240l 16s 8d at 3¼ per cent?

Anſwer £7 16 6½

INSURANCE,

INSURANCE,

IS a ſecurity given in conſideration of a premium paid down, to reſtore, to a certain value for which the premium is advanced, the loſs or damage on ſhips, houſes, goods, &c. which may happen by ſtorms, fire, &c.

EXAMPLES. (Page 200)

Ex. 1. What is the inſurance of a houſe and goods, valued at 4680l at $10\frac{1}{2}$ per cent? Anſ. £491 8 0

2. What is the inſurance of 9000l at $10\frac{3}{4}$ per cent? Anſ. £967 10 0

3. What is the inſurance of 782l 10s at $15\frac{1}{2}$ per cent? Anſ. £121 5 9

4. What is the inſurance of 780l at $5\frac{3}{8}$ per cent? Anſ. £41 18 6

5. Suppoſe I ſhipped goods to the value of 1500l and made an inſurance at $6\frac{1}{2}$ per cent. what does it come to? Anſ. £97 10 0

PURCHASING STOCKS.

STOCK is a general name for the capitals of our trading companies.

EXAMPLES. (Page 201.)

Ex. 1. What is the purchaſe of 2680l South Sea ſtock at 110 per cent?

£.
2680
10

268|00 Int. for exceſs above 100.
2680 Principal

£.2948 Anſ.

By Practice.
Per cent.
100=1)2680

$10=\frac{1}{10}$)2680
268

£. 2948

2. What is the purchaſe of 640l 8s India ſtock at 120l per cent? Anſ. £768 9 7$\frac{1}{5}$

3. What is the purchaſe of 926l bank ſtock at 130$\frac{1}{2}$ per cent? Anſ. £1208 8 7$\frac{1}{5}$

4. What is the purchaſe of 1752l bank annuities at 115$\frac{5}{8}$ per cent? Anſ. £2025 15 0

5. What does 1200l capital ſtock in the 3 per cent conſolidated bank annuities come to at 84$\frac{1}{8}$ per cent?
Anſ. £1009 10 0

6. A gentleman bought 1300l bank annuities at 90$\frac{3}{8}$ per cent. and paid brokage $\frac{1}{8}$ per cent. what did the whole amount to? Anſ. £1176 10 0

DISCOUNT,

IS the abatement made by paying a ſum of money before it is due.

RULE.

1. As the amount of one hundred pounds for the given rate and time is to one hundred pounds, ſo is the given ſum or debt to the preſent worth.

2. Subtract the preſent worth from the given ſum, the remainder is the diſcount required. Or, as the amount of one hundred pounds for the given rate and time is to the intereſt of one hundred pounds for that time, ſo is the given ſum or debt to the diſcount required.

EXAMPLES. (Page 203.)

Ex. 1. What is the diſcount of 120l for 12 months at 5 per cent?

```
                    £.   £.   £.
  100              105 : 5 :: 120
    5                           5
  ----                    ------£. s. d.
  5|00 Intereſt        105)600(5 14  3¼ 75 Rem.
                           525
                           ---
                           ·75
                            20
                          ----
                     105)1500(14s.
                          105
                          ---
                          ·450
                           420
                           ---
                           ·30
                            12
                           ---
                      105)360(3d.
                          315
                          ---
                          ·45
                            4
                          ---
                      105)180(¼q.
```

2. Sold goods to the value of 50l to be paid in twelve months, what muſt be diſcounted for preſent payment, allowing diſcount at 5 per cent? Anſ. 2l 7s 7¼d 75 rem.

3. What preſent money will diſcharge a debt of 200l payable at the end of twelve months, diſcount being made at 5 per cent? Anſ. 190l 9s 6¼d 15 rem.

4. How much ready money for a note of 36l due 3 months hence, diſcounted at 5 per cent? Anſ. 35l 11s 1¼d 1350 rem.

5. What is the diſcount of 573l 16s due 3 years hence, diſcount at 4½ per cent? Anſ. 68l 4s 11¾d 83 rem.

6. What preſent money will diſcharge a debt of 130l due one year and nine months hence, diſcount at 4⅜ per cent?

Anſ. 120l 15s 1d 546 rem.

7. How much preſent money muſt be allowed for a bill of 399l 13s 4d payable in 73 days, diſcount being made at 5 per cent? Anſ. 395l 14s 2¼d $\frac{19}{101}$

COM-

COMPOUND INTEREST,

IS that which ariſes from both principal and intereſt taken together, as it becomes due at the end of each ſtated time of payment.

RULE.

Find the amount of the given principal for the time of the firſt payment, by ſimple intereſt, then conſider this amount as the principal for the ſecond payment, whoſe amount calculate in the ſame manner, and ſo on through all the payments, ſtill accounting the laſt amount as the principal for the next payment.

EXAMPLES. (Page 208.)

Ex. 1. What is the amount of 50l for three years, at 5 per cent. per annum, compound intereſt?

```
 £.        £.  s.
 50        50  0=firſt year's principal
  5         2 10=firſt year's intereſt
----      ------
2|50       52 10=ſecond year's principal
  20           5
----      ------     £.  s.  d.
10|00    2|62 10     52  10  0=ſecond year's principal
              20      2  12  6=ſecond year's intereſt
         -------     ---------
           12|50     55.  2  6=third year's principal
              12              5
         -------     ----------
            6|00   2|75  12  6
                     20
                   -----
                   15|12
                      12
                   -----
                    1|50
                       4
                   -----
 £.  s.  d.         2|00
 55   2  6 =third year's principal
  2  15  1½=third year's intereſt
-----------
£.57 17  7½ Amount. Anſwer
```

2. What is the amount of 100l for four years, at 5 per cent. per annum, compound intereſt? Anſ. £121 11 0 $\frac{3}{20}$

3. What will 100l amount to in 4 years at 5 per cent. per annum, compound intereſt, ſuppoſing the intereſt payable half yearly? Anſ. £121 16 9

4. What will 100l the intereſt payable quarterly, amount to in 2 years, at 5 per cent. per annum, compound intereſt? Anſ. £110 8 10¾

5. What is the compound intereſt of 450l forborn five years, at 4 per cent. per annum? Anſ. £97 9 10½

EQUATION OF PAYMENTS.

IS the finding a time to pay at once ſeveral debts due at different times, ſo that no loſs ſhall be ſuſtained by either party.

RULE.

Multiply each payment by the time it is due at, then divide the ſum of the products by the ſum of the payments, the quotient will be the equated time.

EXAMPLES. (Page 214.)

Ex. 1. A owes B 200l, to be paid as follows, viz. 100l in 4 months, and 100l in 6 months, but if it be reduced to one payment, at what time muſt it be made?

```
      £.          £.
     100         100
       4           6
    ----        ----
     400         600
                 400
              ------
       2|00) 10|00
              ------
        Anſ. 5 months.
```

2. A debt is to be diſcharged thus, viz. 200l preſent, 600l at 4 months, and the reſt at 6 months, what is the equated time for the whole? Anſ. 3⅘ months

3. A debt of 240l due as follows, viz. 100l at 2 months, 80l at 5 months, and the reſt at 7 months, when muſt the whole be paid? Anſ. 4¼ months

4. A debt of 700l is to be diſcharged thus, 100l in 2 months, 200l in 4 months, 300l in 6 months, and the reſt in 12 months, what is the equated time for the whole? Anſ. 5 5/7 months

5. A tradeſmen hath owing him 900l to be paid as ſollows, viz. 100l at 4 months, 200l at 5 months, and the reſt at 12 months, but they agree to have but one payment of the whole, at what time muſt it be made? Anſ. 9 5/9 months

6. A father left his ſon 1200l to be paid thus, one-third in 3 months, one-third in 4 months, and one-third in 8 months, but the executor agrees with the youth to pay it him all together, when muſt the payment be made? Anſ. in 5 months

BARTER,

IS the exchanging of one commodity for another, ſo that neither party may ſuſtain loſs.

RULE.

Find the value of that commodity whoſe quantity is given, then find what quantity of the other, at the rate propoſed, you may have for the ſame money, the quantity is the anſwer.

EXAMPLES. (Page 215.)

Ex. 1. How many pounds of raiſins, at 6d per pound, muſt I give in barter for 30 pounds of tobacco at 2s per pound?

lb. *s.* *lb.*
1 : 2 :: 30
2
20)60
£.3

d. *lb.* £.
6 : 1 :: 3
20
60
12
6)720
lb. 120 Anſ.

2. How many pounds of tobacco at 2s per pound, muſt I receive in barter for 120 pounds of raiſins at 6d per pound? Anſ. 30 pounds

3. What quantity of tea at 8s per pound, muſt I give in barter for 2 cwt of coffee at 2s per pound? Anſ. 56 pounds

4. What quantity of coffee at 2s per pound, muſt I give for 56 pounds of tea at 8s per pound? Anſ. 2 cwt

5. A delivered 252 yards of cloth at 5s per yard to B, for 6 hhds of wine, what was the wine per gallon? Anſ. 3s 4d

6. B delivered 6 hhds of wine at 3s 4d per gallon to A, for 252 yards of cloth, what was the cloth per yard? Anſ. 5s

7. A hath cloth at 8s 4d per yard, ready money, but in barter will have 10s per yard; B hath hops worth 20d per pound, ready money, how muſt B rate his hops per pound, that his profits may be equal to A's? Anſ. 2s per lb

8. B hath hops at 20d per pound, ready money, but in barter will have 2s per pound; A hath cloth worth 8s 4d per yard, ready money, how muſt A rate his cloth per yard, that his profit may be equivalent with B's? Anſ. 10s per yard

9. A and B barter; A hath 82 cwt of cheeſe at 30s per cwt, for which B gives him 20l in money, and the reſt in raiſins at 5d per pound, what quantity of raiſins muſt A receive? Anſ. 44 cwt, 0 qr, 16 pounds

10. B and A barter; B hath 44 cwt 16 pounds of raiſins at 5d per pound, which he gives to A and 20l in money, for cheeſe at 30s per cwt, what quantity of cheeſe muſt B receive? Anſ. 82 cwt,

LOSS AND GAIN.

BY this rule we diſcover what is got or loſt in buying or ſelling of goods, and how to raiſe or fall the price, ſo as to gain or loſe ſo much per cent.

RULE.

1. Say as the whole quantity of goods is to the ſum of the coſt and propoſed gain, ſo is any part of the ſaid goods to the price they muſt be ſold for.

2. When the propoſed gain or loſs is at ſo much per cent. if gain, make 100l. with the gain added to it, your ſecond term; if loſs, ſubtract the loſs from 100l. the remainder make your ſecond term.

EXAMPLES. (Page 218.)

Ex. 1. Bought 4 cwt of cheeſe at 30s per cwt, which I ſold out at $4\frac{1}{4}$d per pound, what is my whole profit?

C. *s.* *C.*

1 : 30 :: 4

4

2|0)12|0

£. 6 what bought for

lb. *d.* *C.*

1 : $4\frac{1}{4}$ :: 4

4 4

18 16

28

448

18

4)8064

12)2016

2|0)16|8

£. 8 8 what ſold for

6 0 bought for

£. 2 8 gained thereby.

2. At what price muſt I ſell raiſins per cwt, which coſt 30s per cwt, to gain 10 per cent? Anſ. £1 13 0

3. How muſt I ſell coffee per cwt that coſt 33s, to loſe 10 per cent? Anſ. 1 9 8¼ $\frac{6}{10}$

4. Bought cloth at 6s 8d per yard, which not proving ſo good as I expected, I am reſolved to loſe 15 per cent by it, how muſt I ſell it per yard? Anſ. 5s 8d

5. If I buy cloth at 6s 8d per yard, how muſt I ſell it per yard to gain 15 per cent? Anſ. 7s 8d

6. If I buy tobacco at 10l 10s per cwt, at what rate muſt I retail it at per pound to gain 10 per cent? Anſ. 2s 0¾d

7. Bought goods at 10l 10s per cwt, and ſold them again retail at 2s 0¾d per pound, what was the gain per cent?
Anſ. 10l per cent

8. If I buy cloth at 5s per yard, what ſhall I gain per cent if I ſell it for 6s 6d per yard? Anſ. 30l

9. At 2s 6d in the pound profit, what is gained per cent?
Anſ. £12 10 0

SINGLE FELLOWSHIP.

BY this rule any number may be divided into any aſſigned number of parts which ſhall be proportional to ſo many other propoſed numbers.

RULE.

Say by the Rule of Three, as the whole ſtock is to the whole gain or loſs, ſo is each man's particular ſtock to his particular part of the gain or loſs.

EXAMPLES. (Page 221.)

Ex. 1. Two perſons, A and B, trade together; A put into ſtock 40l, and B 60l, they gain by trading 50l, what is each perſon's ſhare of the profit?

£.
40
60
———
£. £.
100 : 50 :: 40
40
———
1|00)20|00
———
£ 20 A's ſhare
———

£. £. £.
100 : 50 :: 60
60
———
1|00)30|00
———
30 B's ſhare
20 A's ſhare
———
£ 50 Proof.
———

2. Two merchants, A and B, make a ſtock of 1000l, A put in 300l and B 700l, by trading they cleared 160l, what is each perſon's ſhare thereof? Anſwer A 48l, B 112l

3. Two men make a joint ſtock, A put in 460l, and B 760l, they trade and gain 250l, what is each perſon's ſhare of the gain? Anſwer A's ſhare is 94l 5s $2\frac{3}{4}$d 980 rem.
B's —— 155 14 9 240

4. Three perſons make a joint ſtock, A put in 50l, B 60l, and C 70l, they trade and gain 40l, what is each perſon's ſhare?
Anſwer A's ſhare is 11l 2s $2\frac{1}{2}$d $\frac{12}{18}$
B's —— 13 6 8
C's —— 15 11 $1\frac{1}{2}$ $\frac{6}{18}$

5. Four creditors, A, B, C, and D, gave credit to a tradeſman, who became a bankrupt, worth only 340l, A credited him for 120l, B for 140l, C for 200l, and D for 260l, what muſt each of theſe creditors receive from the bankrupt?
Anſwer A's debt 56l 13s 4d
B's — 66 2 $2\frac{1}{2}$ $\frac{48}{72}$
C's — 94 8 $10\frac{1}{2}$ $\frac{48}{72}$
D's — 122 15 $6\frac{1}{2}$ $\frac{48}{72}$

6. Four men, A, B, C, and D, trade together with a ſtock of 12760l 18s 8d, whereof A advanced 1620l 4s 2d, B 2500l 2s 6d, C 4342l 1s 4d, and D the reſt; but through unforeſeen misfortunes, in one year they loſt 2000l, what is each perſon's ſhare thereof?
Anſwer A's ſhare of the loſs 253l 18s $7\frac{3}{4}$d $\frac{834400}{3062624}$
B's —— —— 391 16 $9\frac{1}{2}$ $\frac{2580416}{3062624}$
C's —— —— 680 10 $5\frac{3}{4}$ $\frac{2872928}{3062624}$
D's —— —— 673 14 $0\frac{1}{4}$ $\frac{2900128}{3062624}$

7. A gentleman unſkilled in numbers, ordered 2280l to be divided amongſt his four ſons, thus; give A, ſays he, one-third, B one-fourth, C one fifth, and D one-ſixth; you are therefore required to part this equitably amongſt them.

Anſwer A 800l, B 600l, C 480l, D 400l

8. Five parties of men, belonging to a man of war, of 45l 60, 64, 72, and 80 men in a party, plundered the enemy of 24075l, you are required to divide this money amongſt them, ſo that each party ſhall have their proportional ſhare.

Anſwer Firſt party's ſhare 3375l, ſecond 4500l,
third 4800l, fourth 5400l, fifth 6000l

DOUBLE FELLOWSHIP,

IS when equal or different ſtocks are employed for different times.

RULE.

Multiply each man's ſtock by the time of its continuance, then ſay, as the ſum of the products is to the whole gain or loſs, ſo is each man's particular product to his ſhare of the loſs or gain.

EXAMPLES. (Page 231.)

Ex. 1. Two partners, A and B, enter into partnerſhip, A put in 40l for 3 months, and B 20l for 4 months; they trade and gain 10l, how muſt it be divided between them?

```
 £.          £.             200 : 10 :: 80
 40          20                       80
  3           4                     ————
———          ——                2|00)8|00
120          80                     ————
 80                            4 B's ſhare
———                            6 A's ſhare
200 : 10 :: 120                     ————
       120                     £10 Proof.
      ————                        ————
2|00)12|00
      ————
£6 A's ſhare.
   ———
```

2. Three merchants, A, B, and C, engage in partnerſhip, A put in 120l for 4 months, B 230l for 3 months, and C 360l for 2 months; they trade and gain 120l, required each perſon's ſhare of the gain?

Anſwer A's ſhare is 30l 9s $6\frac{1}{4}$d $\frac{27}{189}$
B's ditto 43 16 $2\frac{1}{4}$ $\frac{27}{889}$
C's ditto 45 14 $3\frac{1}{4}$ $\frac{135}{189}$

3. Four butchers, A, B, C, and D, jointly hired a paſture of a neighbour for 14l, into which A turned ſix oxen for 12 days, B eight oxen for 14 days, C ten oxen for 16 days, and D twelve oxen for 20 days, how much muſt each butcher pay for his ſhare of the paſture?

Anſwer A's ſhare 1l 14s 6d $\frac{576}{384}$
B's ditto 2 13 $8\frac{1}{4}$ $\frac{312}{384}$
C's ditto 3 16 $8\frac{1}{2}$ $\frac{112}{384}$
D's ditto 5 15 $0\frac{3}{4}$ $\frac{168}{384}$

4. Four merchants trade after this manner; A puts in 100l for 8 months, B puts in 80l for 5 months, and then puts in 20l more for 3 months longer, C puts in 176l for 4 months, and then takes out 40l for 4 months more, D puts in 230l for 6 months, and then takes out the whole; they gained 200l, what is each merchant's ſhare thereof?

Anſwer A's ſhare 38l 15s $2\frac{1}{4}$d $\frac{1248}{4128}$
B's ditto 33 18 $3\frac{1}{2}$ $\frac{576}{4128}$
C's ditto 60 9 $3\frac{1}{2}$ $\frac{2112}{4128}$
D's ditto 66 17 $2\frac{1}{2}$ $\frac{192}{4128}$

5. Three merchants, A, B, and C, trade with a common ſtock of 2000l. A gains 200l in 8 months, B 168l in 18 months, and C 240l in 6 months; what was each of their particular ſtocks? Anſwer A's ſtock 632l 18s $2\frac{1}{2}$d $\frac{74}{79}$
B's ditto 354 8 $7\frac{1}{4}$ $\frac{13}{79}$
C's ditto 1012 13 $1\frac{3}{4}$ $\frac{71}{79}$

ALLIGATION MEDIAL,

TEACHETH how to find the mean rate of a mixture, when the particular quantities mixed, and their ſeveral rates are given.

RULE.

Multiply each quantity of the mixture by its price; then the ſum of the products divided by the ſum of the quantities, gives the mean rate of the compound.

EXAMPLES. (Page 240.)

Ex. 1. Suppoſe 16 buſhels of wheat, at 6s a buſhel, and 8 buſhels of rye, at 4s a buſhel, were mixed together, how muſt the compound be ſold per buſhel, without loſs or gain?

$$\begin{array}{lrl}
\textit{Buſh.}\ \ s. & s. & \\
16\times 6 = & 96 & \\
8\times 4 = & 32 & s.\ \ d. \\
\hline
24) & 128(& 5\ \ 4\ \text{Anſ.} \\
 & 120 & \\
\cline{2-2}
 & \cdot\cdot 8 & \\
 & 12 & \\
\cline{2-2}
 & 24)96(& 4d \\
 & 96 & \\
\cline{2-2}
\end{array}
\qquad\qquad
\begin{array}{rrr}
s. & d. & \\
5 & 4 & \\
 & & 4\times 6=24 \\
\hline
1 & 1 & 4 \\
 & & 6 \\
\hline
\pounds\, 6 & 8 & 0=128s\ \text{Proof.} \\
\hline
\end{array}$$

2. A Tea-dealer mixed 2 pounds of tea at 4s a pound, with 2 pounds at 5s per pound, and 3 pounds at 8s per pound, how muſt the mixture be ſold per pound? Anſwer 6s

3. With 36 gallons of canary at 6s 6d per gallon, I mixed 12 gallons of white wine at 5s per gallon, and to theſe added 12 gallons of cyder at 3s per gallon, at what rate muſt I ſell this mixture per gallon? Anſwer 5s 6d

4. A goldſmith melts 3 pounds of gold of 18 caracts fine, 1 pound of 20 caracts fine, 1 pound of 22 caracts fine, and 3 pounds of 24 caracts fine, how many caracts fine is this mixture? Anſwer 21 caracts fine

5. A maltſter mixes 12 buſhels of malt at 6s a buſhel, 6 buſhels at 5s, 6 at 4s 6d, 18 at 3s 6d, and 24 at 3s, at what rate may he ſell this mixture per buſhel? Anſwer 4s

6. Having mixed together 4 gallons of ale at 16d per gallon, 4 at 12d, 3 at 9d, 1 at 5d, and 12 at 4d, how much per gallon is the mixture worth? Anſwer 8d

ALLIGATION ALTERNATE,

IS the method of finding what quantity of any number of ſimples, whoſe rates are given, will compoſe a mixture of a given rate.

RULE.

1. Write the rates of the ſimples in a column under each other.
2. Link with a continued line the rate of each ſimple which is leſs than that of the compound, with one or any number of thoſe which are greater, and each greater rate with one or any number of the leſs.
3. Write the difference between the mixture rate, and that of each of the ſimples, oppoſite the rates with which they are linked.
4. If only one difference ſtand againſt any rate, it will be the quantity belonging to that rate; but if there be ſeveral, their ſums will be the quantity.

EXAMPLES. (Page 241.)

Ex. 1. A man would mix wheat at 6s per buſhel, with rye at 4s per buſhel, to ſell it at 5s 4d per buſhel; how much of each muſt he take?

$$\begin{array}{llll} & d. & buſh. & \\ 64 & \left\{\begin{matrix}72\\48\end{matrix}\right\} & \begin{matrix}16\text{ wheat}\\8\text{ rye}\end{matrix} & \Big\}\text{ Anſ.}\end{array} \qquad \begin{array}{rl} 72\times16= & 1152 \\ 48\times\ 8= & \underline{\ 384} \\ \underline{\quad} & \quad d. \\ 24) & 1536(64\text{ proof} \\ & \underline{144} \\ & \ \ 96 \\ & \ \ \underline{96} \end{array}$$

2. How much tea at 4s, at 5s, and at 8s per pound muſt be mixed together that the compound may be worth 6s per pound? Anſ. 2lb. at 4s, 2 at 5s, and 3 at 8s

3. How much wine at 6s 6d, at 5s, and at 3s per gallon, muſt be mixed together that the compoſition may be worth 5s 6d per gallon?

Anſ. 36 gal. at 6s 6d, 12 at 5s, and 12 at 3s

4. A goldſmith hath gold of 18, 20, 22, and 24 caracts fine, how much muſt he take of each ſort to make it 21 caracts fine? Anſ. 3 at 18, 1 at 20, 1 at 22, 3 at 24

5. A maltſter hath malt at 6s, 5s, 4s 6d, 3s 6d, and 3s. per buſhel, how much of each ſort muſt he take to ſell it at 4s per buſhel?

Anſ. 12 at 6s, 6 at 5s, 6 at 4s 6d, 18 at 3s 6d, 24 at 3s

6. A victualler hath ale at 16d, at 12d, at 9d, at 5d, and at 4d per gallon, how many gallons of each ſort muſt he take to ſell it at 8d per gallon?

Anſ. 4 at 16d, 4 at 12d, 3 at 9d, 1 at 5d, 12 at 4d

ALLIGATION PARTIAL.

THIS rule is ſo called becauſe a part of the mixed ingredients only are given.

RULE.

Take the difference between each price and the mean rate, then ſay, as the difference oppoſite to the known quantity is to the given quantity, ſo is any other difference to its reſpective quantity ſought.

EXAMPLES.

EXAMPLES. (Page 243.)

Ex. 1. A farmer would mix 8 buſhels of wheat at 6s per buſhel, with rye at 4s per buſhel, how much rye muſt he take that the mixture may be worth 5s 4d per buſhel?

$$\begin{array}{lccl} & d. & d. & bu. \\ \text{mean} & 64 & \left\{\begin{array}{c}72\\48\end{array}\right\} & \begin{array}{l}16 \text{ wheat}\\ 8 \text{ rye}\end{array}\end{array}$$

As 16 : 8 :: 8 : 4 buſhels, Anſwer

2. To 6 pounds of tea at 8s per pound, a grocer mixed inferior teas at 5s and 4s per pound, how much of the two laſt ſorts muſt he take to mix with the given quantity, to ſell the compoſition at 6s per pound?

Anſwer 4 lb of each of the other ſorts

3. How much wine at 3s and 5s per gallon, muſt be mixed with 18 gallons of canary at 6s 6d per gallon, ſo that the mixture may be worth 5s 6d per gallon?

Anſwer 6 gallons of the other two ſorts

4. How much gold of 20, 22, and of 24 caracts fine, muſt be mixed with 6 pounds of 18 caracts fine, ſo that the compoſition may be 21 caracts fine?

Anſwer 2lb of 20 and 22, and 6lb 24 caracts fine

5. How much malt at 5s, 4s 6d, 3s 6d, and 3s per buſhel, muſt be mixed with 6 buſhels at 6s per buſhel, that the mixture may be ſold for 4s per buſhel?

Anſwer 12 at 5s, 12 at 4s 6d, 36 at 3s 6d, 48 at 3s

6. How much ale at 4d, at 5d, at 9d, and at 12d a gallon, muſt be mixed with 8 gallons at 16d per gallon, that the mixture may be worth 8d a gallon?

Anſwer 8 gallons at 12d, 6 at 9d, 2 at 5d, 24 at 4d

ALLIGATION TOTAL.

IS when the total ſum of the quantities to be mixed, price of each, and mean price given, and the particular quantity of each ingredient is required.

RULE.

As the ſum of all the differences is to the whole quantity of the mixture, ſo is each particular difference to its particular quantity.

EXAMPLES. (Page 245.)

Ex. 1. How many gallons of water muſt be mixed with wine worth 4s per gallon, ſo as to fill a veſſel of 16 gallons, that a gallon may be ſold for 3s?

$$3\left\{\begin{matrix}4\\0\end{matrix}\right\}\begin{matrix}3\\1\\\hline\end{matrix}\qquad\begin{matrix}g. & & g.\\4 & : & 16\end{matrix}\quad :: \quad\left\{\begin{matrix}g. & & g.\\3 & : & 12\text{ wine}\\1 & : & \underline{4}\text{ water}\end{matrix}\right.$$

ſum 4 proof 16 gallons

$$\begin{matrix} & g. & & s. & & g. & & s.\\ \text{Or, As} & 16 & : & 48 & : & 1 & : & 3\end{matrix}$$ mean price, given proof

2. A grocer hath ſugar at 3d, 4d, 6d, and 10d a pound, and he would make a mixture of 112 pounds, ſo that it might be afforded at 6d per pound, how much of each ſort muſt he take?

Anſwer $26\frac{6}{7}$ lb at 3d, $26\frac{6}{7}$ at 4d, $26\frac{6}{7}$ at 6d, $32\frac{16}{17}$ at 10d

3. A goldſmith would mix gold of 22, of 20, of 18, of 17, and 14 caracts fine, how much of each ſort muſt be melted together to form a compoſition of 200 ounces of 19 caracts fine?

Anſwer $76\frac{12}{13}$ oz of 22, $46\frac{2}{13}$ of 20, $15\frac{5}{13}$ of 18, $15\frac{5}{13}$ of 17, $46\frac{2}{13}$ of 14

4. A farmer would mix wheat at 8s with rye at 6s, barley at 4s, and oats at 2s per buſhel, to be ſold at 4s 8d per buſhel, how much of each ſort muſt he take to have a quantity of 240 buſhels?

Anſwer 80 of wheat, 20 rye, 40 barley, 100 oats

5. A goldſmith would mix gold of 24, of 21, and of 19 caracts fine, with a quantity of alloy, ſo that 190 ounces might bear 16 caracts fine, how much of each ſort muſt he take? Anſwer 47½ oz of each ſort

EXCHANGE,

CONSISTS in finding what ſum of money of one country will be equal to any given ſum of another, according to a certain given courſe of exchange.

ENGLAND WITH FRANCE.

Accounts are kept in France in livres, ſols, and deniers, and they exchange by the crown tournois.

12 deniers	make one	ſol
20 ſols		livre
3 livres		ecu, or crown tournois
10 livres		piſtole
24 livres		louis d'or, or guinea

Exchange from 30d to 50d ſterling per ecu.

EXAMPLES. (Page 247.)

Ex. 1. What ſterling money muſt be paid in London to receive in Paris 1000 crowns, exchange 30d per crown, or ecu?

cr. *d.* *cr.*
1 : 30 :: 1000
30

12)30000

2|0)250|0

£. 125 Anſwer

2. What number of crowns muſt be paid in Paris to receive in London 125l, exchange 30 pence per crown?
Anſwer 1000 crowns

3. In 280 livres, 13 ſols, 4 deniers, how much ſterling, exchange at 31d per ecu? Anſwer £12 1 $8\frac{2}{9}$

4. In 12l 1s 8d$\frac{2}{9}$ ſterling, how much French money, exchange at 31d ſterling per ecu? Anſwer 280l, 13 ſol, 4 den

5. What ſterling money is equal in value to 2148 French crowns, 2 livres, 4 ſols, 6 deniers, exchange at 4s 2d per crown? Anſwer £447 13 $1\frac{1}{12}$

6. A gentleman on his travels received in France 2148 crowns, 2 livres, 4 ſols, 6 deniers, for a bill of exchange whoſe value in England was 447l 13s $1\frac{1}{12}$d ſterling; what was the exact courſe of exchange? Anſwer £0 4 2

SPAIN.

Accounts are kept in Spain in piaſtres, rials, and marvadies, and they exchange by the piaſtre or piſo.

4 Marvadies vellon, or 2⅛ marvadies of plate	make one	Quarta
8½ Quartas, or 34 marvadies vellon		Rial vellon
16 Quartas, or 34 marvadies of plate		Rial of plate
8 Rials of plate		Piſo, piaſtre, piece of 8 or dol.
5 Piaſtres		Spaniſh piſtole
2 Piſtoles		Doubloon

Exchange from 38d to 50d ſterling per piſo.

EXAMPLES. (Page 249.)

Ex. 1. In 1440l how many piaſtres, exchange at 50d per piaſtre or piſo?

d. *P.* *£.*
50 : 1 :: 1440
20

28800
12

5|0)34560|0

Anſ. 6912 piaſtres

2. Suppoſe Spain draws upon London for 6912 piaſtres, what ſterling money will the draft amount to, when the exchange is at 50d ſterling per piſo? Anſwer 1440l

3. How much ſterling money muſt be received at London, for a bill remitted from Cadiz, of 2600 piaſtres, 6 rials, and 20 marvadies; exchange at 48d per piaſtre?

Anſwer £520 3 $3\frac{36}{68}$

4. How many piaſtres muſt be received at Cadiz, for 520l 3s $3\frac{36}{68}$d ſterling, exchange at 48d per piaſtre?

Anſwer 2600 pia. 6 ria. 20 mar.

5. A merchant received in Madrid 2600 piaſtres, 6 rials, and 20 marvadies for a bill of exchange, whoſe ſterling value in London was 520l 3s $3\frac{36}{68}$d what was the courſe of exchange? Anſwer 48d

PORTUGAL.

Accounts are kept in Portugal in reas and milreas, and the exchange is by the milrea.

400 Reas make one Cruſado.
1000 Reas, or $2\frac{1}{2}$ cruſadoes - - - Milrea.
Exchange from 60d to 67d per milrea.

EXAMPLES. (Page 252.)

Ex. 1. How many milreas will 3656l amount to; exchange at 60d per Milrea?

s. *mil.* *£.*
5 : 1 :: 3656
20

5)73120

Anſ. 14624 mil.

2. In 14624 milreas, how many pounds ſterling; exchange at 60d ſterling per milrea? Anſwer 3656l

3. Suppoſe a bill of 360l 4s 8d ſterling was drawn at Birmingham to be paid in Liſbon; how many milreas, &c. will this bill amount to; exchange at 64d per milrea?

Anſwer 1350 mil. 875 reas

4. How much ſterling money will 1350 milreas, 875 reas, amount to; exchange at 64d per milrea?

Anſwer £360 4 8

HOLLAND, FLANDERS, AND GERMANY.

Accounts are kept in theſe places, in guilders, ſtivers, and pennings; or in pounds, ſhillings and pence, as in England.

The money of Holland and Flanders is diſtinguiſhed by the name of Flemiſh, and they exchange by the pound ſterling.

8 pennings	make one	grote or penny
2 grotes		ſtiver
6 ſtivers		ſchilling
20 ſtivers		florin or guilder
2½ florins		rix-dollar
6 florins		pound Flemiſh

Exchange from 33s 6d to 36s 6d Flemiſh per pound ſterling.

Agio from 3 to 6 per cent. for current.

To turn current money into banco.

RULE.

As 100 with the agio added to it, is to 100, ſo is any given ſum current to its value banco.

EXAMPLES. (Page 253)

Ex. 1. How much bank money can I have for 2982 guilders current money, the agio being 5 guilders per cent?

```
gil.  gil.    gil.
105 : 100 :: 2982
               100
       ———————— guil.
     105)298200(2840 Anſ.
         210
         ————
          882
          840
          ————
           420
           420
           ————
             0
```

2. How much bank money, the agio being 4 per cent. can I have for 110 guilders, 12 ſtivers?

Anſwer 106 guil. 6 ſtiv. 1 gr. 6$\frac{10}{13}$ pen.

To turn banco money into current.

RULE.

As 100, is to 100 with the agio added to it, ſo is any given ſum to its value current.

3. Change 2840 guilders banco, into current money; agio 5 per cent? Anſwer 2982

4. Change 106 guilders, 6 ſtivers, 1 grote, 6$\frac{10}{13}$ pennings banco, into current money; agio 4 per cent?

Anſwer 110 guil. 12 ſtiv.

To reduce Flemiſh pounds, ſhillings, and pence into guilders.

RULE.

Divide the whole ſum, when reduced into pence Flemiſh by 40 (the number of pence in one guilder) the quotient will be guilders; the remainder (if any) divide by 2, the pence in one ſtiver, and the quotient will be ſtivers.

5. In 640l Flemiſh, how many guilders? Anſwer 3840

6. In 3840 guilders, how many Flemiſh pounds?
Anſwer 640l

7. In 864l 12s Flemiſh, how many guilders?
Anſwer 5187 guil. 12 ſtiv.

8. In 5187 guilders, 12 ſtivers, how many Flemiſh pounds?
Anſwer 864l 12s

To reduce ſterling into Flemiſh money.

RULE.

As one pound ſterling is to the given rate of exchange, ſo is the given ſterling to the Flemiſh ſought.

9. To how much Flemiſh will 350l ſterling amount, exchange at 34s per pound ſterling? Anſwer 595l

10. How much Flemiſh muſt be given for 842l 5s ſterling, exchange at 33s 6d Flemiſh per pound ſterling?
Anſwer £1410 15 $4\frac{1}{2}$.

To reduce Flemiſh money into ſterling.

RULE.

As the given rate of exchange is to one pound ſterling, ſo is the given Flemiſh to the ſterling required.

11. To how much ſterling will 595l Flemiſh amount, exchange at 34s per pound ſterling? Anſwer 350

12. How much ſterling muſt be given for 1410l 15s $4\frac{1}{2}$d Flemiſh, exchange at 33s 6d per pound ſterling?
Anſwer £842 5 0

13. In 5187 florins, 12 ſtivers banco, how many pounds ſterling, exchange at 34s per pound Flemiſh?
Anſwer £508 11 $9\frac{3}{17}$

14. A merchant received in Amſterdam 5187 florins, 12 ſtivers banco, for a bill whoſe ſterling value was 508l 11s $9\frac{3}{17}$d, what was the courſe of exchange per pound Flemiſh?
Anſwer 34s

HAMBRO.

Accounts are kept at this place in marks and ſol lubs, and exchange by the pound ſterling as in Holland.

2 deniers	make one	ſol lub
6 ſol lubs		ſol gros
16 ſol lubs		mark
2 marks		drittle, or Hambro dollar
3 marks		rix-dollar
7½ marks		livre gros, or pound Flemiſh.

Exchange from 32s to 35s Flemiſh per pound ſterling, agio from 18 to 20 per cent. for current, and from 30 to 35 per cent. for ſlight.

EXAMPLES. (Page 257.)

Ex. 1. In 624 marks of bank money of Hambro, how many pounds ſterling, exchange at 32 ſols gros per pound ſterling?

$$\begin{array}{rcl}
\text{ſ. gr.} & \text{£.} & \text{mks.} \\
32 : & 1 :: & 624 \\
6 & & 16 \\
\hline
192 & & 9984 \\
2 & & 2 \\
\hline
384 & &)19968(52 \text{ Anſ.} \\
 & & 1920 \\
\hline
 & & \cdot\cdot 768 \\
 & & 768 \\
\hline
\end{array}$$

2. In 52l ſterling, how many Hambro marks, exchange at 32 ſols gros per pound ſterling? Anſ. 624 marks

3. In 1724 marks, 5 ſol. l. banco, how many pounds ſterling, exchange 36 ſol. g. 1 den. per pound ſterling?

Anſ. £127 8 7½ $\frac{258}{433}$

4. In 127l 8s $7\frac{1}{2}$d $\frac{258}{433}$ ſterling, how many Hambro marks, exchange at 36 ſol. gros. 1 den. per pound ſterling?

Anſ. 1724 marks 5 ſol. I.

VENICE.

They keep their accounts at Leghorn in dollars, ſoldi, and denari, and exchange by the ducat and piaſtre.

12 denari	make one	ſoldi
20 ſoldi		lira, or piaſtre of Leghorn
$5\frac{1}{6}$ ſoldi		groſſo
20 groſſo		ducat

Exchange from 52d to 54d per ducat, and from 45d to 54d per piaſtre, agio 20 per cent.

EXAMPLES. (Page 260.)

Ex. 1. In 460l ſterling, how many piaſtres of Leghorn, exchange at 50d per piaſtre?

$$\begin{array}{r} d. \quad pia. \quad \pounds. \\ 50 : 1 :: 460 \\ 20 \\ \hline 9200 \\ 12 \\ \hline 5|0)11040|0 \\ \hline \end{array}$$

Anſ. 2208 Piaſtres.

2. In 2208 piaſtres, bank money of Leghorn, how many pounds ſterling, exchange at 50d ſterling per piaſtre?

Anſ. 460l

3. Reduce 2918 piaſtres, 10 ſols, bank money of Venice, into ſterling money, exchange at 48d ſterling per piaſtre.

Anſ. 583l 14s

4. In 583l 14s ſterling, how many piaſtres, &c: exchange at 48d per piaſtre? Anſ. 2918 pia. 10 ſol.

5. Reduce 4780 piaſtres, 12 ſols, 6 den. bank money of Venice, into ſterling money, exchange at 53d ſterling per piaſtre. Anſ. £1055 14 $5\frac{1}{8}$

6. In 1055l 14s $5\frac{1}{8}$d ſterling, how many piaſtres, exchange at 53d per piaſtre? Anſ. 4780 pia. 12 ſol. 6 de.

RUSSIA.

They keep their accounts at Peterſburgh in rubles and copecs, and exchange by the ruble.

5 copecs	make one	altine
10 copecs		grivena
25 copecs		polpolitin
2 polpolitins		politin
2 politins		ruble
2 rubles		ducat

Ruſſia exchanges with London by way of Hambro, or Amſterdam, at the rate of 48 to 50 ſtivers per ruble; and ſometimes directly to London from 4s to 5s per ruble.

EXAMPLES. (Page 262.)

Ex. 1. In 614l 11s 8d ſterling, how many rubles, exchange at 4s 2d ſterling per ruble?

s.	*d.*		*rub.*		*£.*	*s.*	*d.*
4	2	:	1	::	614	11	8
12					20		
50					12291		
					12		

5|0)14750|0

Anſ. 2950 Rubles.

2. In 2950 rubles, how many pounds ſterling, exchange 4s 2d per ruble? Anſ. £614 11 8

3. In 940l 12s 6d ſterling, how many rubles, &c. exchange at 4s 6d ſterling per ruble? Anſ. 4180 ru. $55\frac{5}{9}$ cop.

4. In 4180 rubles $55\frac{5}{9}$ copecs how many pounds ſterling, exchange at 4s 6d per ruble? Anſ. £940 12 6

POLAND AND PRUSSIA.

Accounts are kept at Dantzig in florins, gros, and penins, and exchange by the gros.

18 penins	make one	gros
18 gros	make one	oort
30 gros	make one	florin, or Poliſh guilder
3 florins	make one	rix-dollar
2 rix-dollars	make one	gold ducat

Exchange is made with Poland and Pruſſia by way of Holland, the exchange being from 240 to 295 groſſi per pound Flemiſh.

EXAMPLES. (Page 263.)

Ex. 1. In 780l ſterling, how many Pruſſian florins, exchange 270 groſſi per pound Flemiſh, and 33s 4d Flemiſh per pound ſterling?

```
£.  s.  d.       £.         £.  groſſi.      £.
1 : 33  4   ::  780         1 : 270    ::  1300
    12          400                         270
  ------      -------                    -------
   400    12)312000                       91000
              -------                    2600
           2|0)2600|0                    -------
              -------                3|0)35100|0
           £1300 Flem.                   -------
                                Anſ. 11700 Florins.
```

2. In 11700 Pruſſian florins, how many pounds ſterling, exchange 270 groſſi per pound Flemiſh, and 33s 4d Flemiſh per pound ſterling? Anſ. 780l

3. In 875l 12s 6d ſterling, how many rix-dollars, &c. exchange 290 groſſi Poliſh per pound Flemiſh, and 34s 4d Flemiſh per pound ſterling? Anſ. 4843 r. d. 45 gr. 5⅝ pe.

4. In 4843 rix-dollars, 45 groſſi, 5⅝ penins Poliſh, how many pounds ſterling, exchange 290 Poliſh groſſi per pound Flemiſh, and 34s 4d Flemiſh per pound ſterling?

Anſ. £1503 3 1½ Flem, and £875 12 6 ſterl.

SWEDEN.

They keep their accounts at Stockholm, in copper dollars and orts, or in ſilver dollars, and exchange by the copper dollar.

8 penins	make one	runſtychen
3 runſtychens		ſtiver or whitton
8 ſtivers		marc
10 ſtivers and 2 runſtych. or 32 runſtychens		copper dollar
3 copper dol. and 32 ſti. or 96 runſty. or 4 mar.		ſilver dollar
24 marcs		copper rix-dollar

Exchange from 46 to 50 copper dollars per pound ſterling.

EXAMPLES. (Page 267.)

Ex. 1. In 246l ſterling, how many copper dollars, exchange 46 copper dollars per pound ſterling?

$$\begin{array}{rcl} £. & c.d. & £. \\ 1 : & 46 :: & 246 \\ & & 46 \\ \hline & & 1476 \\ & & 984 \\ \hline \end{array}$$

Anſ. 11316 Copper dollars.

2. In 11316 copper dollars, how many pounds ſterling, exchange 46 copper dollars per pound ſterling? Anſ. 246l

3. In 293l 15s ſterling, how many copper dollars, exchange 48 copper dollars per pound ſterling?

Anſwer 14100 cop. dol.

4. In 14100 copper dollars, how many pounds ſterling, exchange 48 copper dollars per pound ſterling?

Anſwer £293 15 0

5. In 5838 ſilver dollars 9 runſtychens, how many pounds ſterling, exchange 49 copper dollars per pound ſterling?

Anſwer £357 8 8 $\frac{23}{98}$

6. In 357l 8s 8d $\frac{23}{98}$ ſterling, how many ſilver dollars, &c. exchange 49 copper dollars per pound ſterling?

Anſwer 5838 ſilver dol. 9 ru.

IRELAND, AMERICA, and the WEST-INDIES.

Accounts are kept in theſe places in pounds, ſhillings, and pence, as in England.

The courſe of exchange between England and Ireland is from 5 to 12 per cent. alſo 5l. ſterling is accounted worth 7l. of the currency of the Weſt Indies, on account of the ſcarcity of caſh.

EXAMPLES. (Page 270.)

Ex. 1. What money muſt be received in Dublin for 750l. ſterling, remitted from London, exchange at 6 per cent?

```
 £.     £.      £.
100 : 106 :: 750
             106
            ----
            4500
           7500
          ------
      1|00)795|00
          ------
         £795 Anſ.
```

2. Ireland remits to London 795l. Iriſh, how much ſterling muſt Ireland be credited with, exchange 6 per cent?

Anſwer 750l.

3. London remits to Dublin 751l. 10s. what muſt be received there, exchange 10 per cent? Anſ. £826 13 0

4. Dublin remits to London 826l. 13s. what muſt be received there, exchange at 10 per cent? Anſ. £751 10 0

5. London remits to Jamaica for 726l. ſterling, what muſt be received for it, exchange at 50 per cent? Anſ. 1089l.

6. Jamaica remits to London for 1089l. currency, what muſt be received for it, exchange at 50 per cent? Anſ. 726l.

7. Philadelphia is indebted to London 1089l. 10s. currency, what ſterling may London reckon to be remitted when the exchange is 60 per cent? Anſ. £680 18 9

8. London receives a bill of exchange from Philadelphia for 680l. 18s. 9d. ſterling, for how much currency was London indebted, exchange being at 60 per cent?

Anſ. £1089 10 0

ARBITRATION OF EXCHANGES,

IS the method of finding ſuch a rate of exchange between any two places as ſhall be in proportion with the rates aſſigned between each of them, and a third place.

EXAMPLES. (Page 272.)

Ex. 1. If the exchange between London and Amſterdam be 33s. 4d. per pound ſterling, and the exchange between London and Paris be 33d. per crown, required the par of arbitration between Amſterdam and Paris?

```
      £.      s. d.      d.
      1   :   33 4   ::  33
     20       12
    ----     -----
     20      400
     12       33
    ----     -----
    240     1200
            1200
           ------
       { 4)1320|0
  24|0 {   ------
       { 6) 330
           ------
  Anſ. 55d. Flem. per cr.
```

2. If the exchange between Amſterdam and Paris be 55d. per crown, and between Amſterdam and London 33s. 4d. per pound ſterling, required the arbitrated price between Paris and London? Anſ. 33d.

3. London changes with Amſterdam, on par at 33s. 4d. Flemiſh per pound ſterling; Amſterdam changes on Middleburgh at 3 per cent. advance, how ſtands the exchange between London and Middleburgh? Anſ. £1 14 4

4. If the exchange between Middleburgh and London be 1l. 14s. 4d. per pound ſterling, and between Middleburgh and Amſterdam 33s. 4d. and 3 per cent. how ſtands the exchange between Amſterdam and London? Anſ. 33s. 4d.

VULGAR FRACTIONS,

ARE expreſſions for any aſſignable part or parts of an unit, and are repreſented by two numbers placed one above another, with a line drawn between them thus $\frac{2}{3}$. The figure above the line is called the numerator, and that below the denominator.

The denominator ſhews how many parts the integer is divided into, and the numerator ſhews how many of thoſe parts are meant by the fraction.

A proper fraction is when the numerator is leſs than the denominator, as $\frac{2}{3}$, $\frac{3}{4}$, &c.

An improper fraction is when the numerator exceeds the denominator, as $\frac{3}{2}$, $\frac{8}{4}$, &c.

A ſingle fraction is an expreſſion for any number of parts of the integer.

A compound fraction is a fraction of a fraction conſiſting of two or more ſimple fractions, as $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$, &c.

A mixed number is compoſed of a whole number and a fraction, as $8\frac{1}{2}$, $12\frac{3}{4}$, $13\frac{5}{8}$, &c.

REDUCTION of VULGAR FRACTIONS.

CASE I.

To reduce a fraction to another of equal value.

RULE.

Multiply or divide both terms of the fraction by the ſame number, and you will have the fraction required.

EXAMPLES. (Page 273.)

Ex. 1. Reduce $\frac{4}{6}$ to another of equal value.

$$\begin{array}{cc} 4 & 6 \\ 5 & 5 \\ \hline 20 & 30 \end{array} \quad \text{Anſ. } \frac{20}{30}$$

2. Reduce $\frac{20}{30}$ to another fraction of equal value. Anſ. $\frac{4}{6}$
3. Reduce $\frac{8}{12}$ to another fraction of equal value. Anſ. $\frac{24}{36}$
4. Reduce $\frac{24}{36}$ to another fraction of equal value. Anſ. $\frac{8}{12}$

CASE II.

To reduce a whole number to the form of a fraction.

RULE.

Place one under it for a denominator.

EXAMPLES. (Page 273.)

Ex. 5. Let it be required to reduce 4 to the form of a fraction.

$$\frac{4}{1} \text{ Anſ.}$$

6. Let it be required to reduce 6 to the form of a fraction. Anſ. $\frac{6}{1}$

7. Suppoſe 8 to be the whole, required the fraction? Anſwer $\frac{8}{1}$

8. Suppoſe 12 to be the whole, required the fraction? Anſwer $\frac{12}{1}$

CASE III.

To reduce a whole number to a fraction of a given denominator.

RULE.

Multiply the whole number by the given denominator, and under the product write the ſame denominator.

EXAMPLES. (Page 273.)

9. Reduce 8 into a fraction, whoſe denominator ſhall be 4.

$$\begin{array}{r} 8\\ \underline{4}\\ 32 \end{array}$$

then $\frac{32}{4}$ is the Anſwer.

$$\frac{4)32}{8}=\frac{8}{1}=8 \text{ Proof.}$$

10. Let it be required to reduce 6 into a fraction, whoſe denominator ſhall be 5. Anſwer $\frac{30}{5}$

11. Required to reduce 9 into a fraction, whoſe denominator ſhall be 6. Anſwer $\frac{54}{6}$

12. Let it be required to reduce 12 into a fraction, whoſe denominator ſhall be 10. Anſwer $\frac{120}{10}$

CASE IV.

To reduce a compound fraction to a ſingle one.

RULE.

Multiply all the numerators together for a new numerator, and all the denominators together for a new denominator.

EXAMPLES. (Page 274.)

13. Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ to a ſingle fraction.

$$\begin{array}{cc} 1 & 2 \\ 2 & 3 \\ \hline 2 & 6 \\ 3 & 4 \\ \hline 6\ N. & 24\ D. \end{array}$$

Anſ. $\frac{6}{24}$ the ſingle fraction.

14. Reduce $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{6}$ to a ſingle fraction. Anſ. $\frac{30}{72}$

15. Reduce $\frac{3}{4}$ of $\frac{4}{5}$ or $\frac{5}{7}$ to a ſingle fraction. Anſ. $\frac{60}{140}$

16. Reduce $\frac{4}{5}$ of $\frac{5}{6}$ of $\frac{8}{9}$ to a ſingle fraction. Anſ. $\frac{160}{270}$

CASE V.

To reduce a mixed number to an improper fraction.

RULE.

Multiply the whole number by the denominator of the fraction, and to the product add the numerator for a new numerator, which place over the denominator.

EXAMPLES. (Page 274.)

17. Reduce $5\frac{1}{2}$ to an improper fraction.

$$\begin{array}{c} 5\frac{1}{2} \\ 2 \\ \hline 11 \end{array}$$

Anſ. $\frac{11}{2}$ the required fraction.

18. Reduce $6\frac{2}{3}$ to an improper fraction. Anſ. $\frac{20}{3}$

19. Reduce $12\frac{4}{6}$ to an improper fraction. Anſ. $\frac{76}{6}$

20. Reduce $25\frac{3}{8}$ to an improper fraction. Anſ. $\frac{203}{8}$

CASE VI.

To reduce an improper fraction to its equivalent whole or mixed number.

RULE.

RULE.

Divide the numerator by the denominator, the quotient is the whole number, what remains place over the denominator, and annex this fraction to the quotient before found.

EXAMPLES. (Page 275.)

21. Reduce $\frac{11}{2}$ to its equivalent whole or mixed number.

$2)11$

$5\frac{1}{2}$ Anſwer.

22. Reduce $\frac{20}{3}$ to its equivalent whole or mixed number.
Anſwer $6\frac{2}{3}$

23. Reduce $\frac{76}{6}$ to its equivalent whole or mixed number.
Anſwer $12\frac{4}{6}$

24. Reduce $\frac{203}{8}$ to its equivalent whole or mixed number.
Anſwer $25\frac{3}{8}$

CASE VII.

To find the greateſt common meaſure or diviſor for the numerator and denominator of any given fraction, or for any two numbers.

RULE.

Divide the greater term by the leſſer, and the laſt diviſor by the remainder, continually till nothing remains, the laſt diviſor is the greateſt common meaſure required.

EXAMPLES. (Page 275.)

25. What is the greateſt common meaſure of $\frac{72}{120}$?

```
72)120(1
   72
   --
   48)72(1
      48
      --
      24)48(2
         48
         --
```

Anſ. 24 the greateſt common meaſure.

26. What is the greateſt common meaſure of $\frac{126}{182}$? Anſwer 14

27. What is the greateſt common meaſure of $\frac{2146}{3642}$? Anſwer 2

28. What is the greateſt common meaſure of $\frac{365}{4896}$? Anſwer 1

CASE VIII.

To reduce fractions to their loweſt terms.

RULE.

Divide both terms of the fraction by their greateſt common meaſure, the quotient will be the terms of the fraction required.

EXAMPLES. (Page 277)

29. Reduce $\frac{1073}{1821}$ to its loweſt terms.

```
1073)1821(1
     1073
    ------
      748)1073(1   then 1)1073/1821(=1073/1821 Answer.
          748
          ---
          325)748(2
              650
              ---
               98)325(3
                  294
                  ---
                   31)98(3
                      93
                      --
                       5)31(6
                         30
                         --
                          1)5(5
                            5
                            -
```

30. Reduce $\frac{1416}{6424}$ to its loweſt terms. Anſwer $\frac{177}{803}$
31. Reduce $\frac{3642}{4516}$ to its loweſt terms. Anſwer $\frac{1821}{2258}$
32. Reduce $\frac{340}{2136}$ to its loweſt terms. Anſwer $\frac{85}{534}$
33. Reduce $\frac{816}{4446}$ to its loweſt terms. Anſwer $\frac{136}{741}$
34. Reduce $\frac{2688}{3072}$ to its loweſt terms. Anſwer $\frac{7}{8}$

CASE IX.

To reduce fractions of different denominators to thoſe of equal value, having a common denominator.

RULE.

Multiply each numerator by all the denominators, except its own, for a new numerator, and all the denominators together for a new denominator.

EXAMPLES.

EXAMPLES. (Page 279.)

35. Reduce $\frac{2}{3}$, $\frac{3}{4}$ to a common denominator.

2 3 3
4 3 4
— — —
8N. 9N. 12D. Anſ. $\frac{8}{12}$ and $\frac{9}{12}$ the frac. required.

36. Reduce $\frac{3}{4}$, $\frac{4}{5}$, and $\frac{5}{8}$ to a common denominator.
Anſwer $\frac{90}{120}$, $\frac{96}{120}$, $\frac{100}{120}$

37. Reduce $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{6}{7}$ to a common denominator.
Anſwer $\frac{84}{168}$, $\frac{112}{168}$, $\frac{126}{168}$, $\frac{144}{168}$

38. Reduce $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, and $\frac{1}{6}$ to a common denominator.
Anſwer $\frac{120}{360}$, $\frac{90}{360}$, $\frac{72}{360}$, $\frac{60}{360}$

39. Reduce $\frac{5}{8}$, $\frac{4}{9}$, $\frac{5}{10}$, and $\frac{6}{12}$ to a common denominator.
Anſwer $\frac{5400}{8640}$, $\frac{3840}{8640}$, $\frac{4320}{8640}$, $\frac{4320}{8640}$

40. Reduce $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, and $\frac{1}{7}$ to a common denominator.
Anſwer $\frac{840}{2520}$, $\frac{630}{2520}$, $\frac{504}{2520}$, $\frac{420}{2520}$, $\frac{360}{2520}$

CASE X.

To reduce money, weights, meaſures, &c. into fractions.

RULE.

Reduce the given quantity to the loweſt denomination mentioned, and make it the numerator; then reduce the whole of the integer, which the given numbers are parts of, and make it the denominator, and you have the fraction required.

EXAMPLES. (Page 281.)

41. Reduce 3s 6d to the fraction of a pound ſterling.

s. *d.* *s.*
3 6 20
12 12
—— ——
42 240

Anſwer $\frac{42}{240}$ the fraction required.

42. Reduce $6\frac{1}{2}$d to the fraction of a ſhilling. Anſ. $\frac{13}{24}$

43. Reduce 3 roods, 12 poles to the fraction of an acre. Anſwer $\frac{132}{160}$

44. Reduce 2 qrs, 12lb, to the fraction of a cwt. Anſwer $\frac{68}{112}$

45. Reduce $8\frac{1}{2}$ inches to the fraction of a foot. Anſwer $\frac{17}{24}$

46. Reduce $12\frac{1}{2}$ cwt to the fraction of a ton? Anſ. $\frac{25}{40}$

47. Reduce 6 oz, 12 dwts, 16 grs, to the fraction of a pound troy? Anſwer $\frac{3184}{5760}$

48. Reduce 3 qrs, 2 lb, 2 oz, 6 drs, to the fraction of a cwt. Anſwer $\frac{22054}{28672}$

CASE XI.

To reduce fractions of one denomination to another, retaining the ſame value.

RULE.

Firſt, If the fraction given is to be brought from a leſs to a greater denomination, multiply the numerator by all the denominations, from that given to that ſought.

Second, If the fraction given is to be brought from a greater to a leſs denomination, multiply the numerator by all the denominations, from that given to that ſought.

EXAMPLES. (Page 282.)

49. Reduce $\frac{3}{4}$ of a penny to the fraction of a pound?

$$\begin{array}{r} 4 \\ 12 \\ \hline 48 \\ 20 \\ \hline 960 \end{array}$$

Anſwer $\frac{3}{960}$

50. Reduce $\frac{3}{960}$ of a pound to the fraction of a penny. Anſwer $\frac{720}{960}$

51. Reduce $\frac{3}{6}$ of a ſhilling to the fraction of a pound. Anſwer $\frac{3}{120}$

52.

52. Reduce $\frac{3}{120}$ of a pound to the fraction of a ſhilling.
Anſwer $\frac{60}{120}$

53. Reduce $\frac{3}{5}$ of a pound troy, to the fraction of a pennyweight.
Anſwer $\frac{720}{5}$

54. Reduce $\frac{720}{5}$ of a pennyweight to the fraction of a pound troy.
Anſwer $\frac{720}{1200}$

55. Reduce $\frac{3}{5}$ of a dram to the fraction of a cwt.
Anſwer $\frac{3}{143360}$

56. Reduce $\frac{3}{143360}$ of a cwt. to the fraction of a dram.
Anſwer $\frac{86016}{143360}$

57. Reduce $\frac{4}{5}$ of a nail to the fraction of a yard.
Anſwer $\frac{4}{80}$

58. Reduce $\frac{4}{80}$ of a yard to the fraction of a nail.
Anſwer $\frac{64}{80}$

59. Reduce $\frac{8}{9}$ of a minute to the fraction of a day.
Anſwer $\frac{8}{12960}$

60. Reduce $\frac{8}{12960}$ of a day to the fraction of a minute.
Anſwer $\frac{11520}{12960}$

CASE XII.

To find the value of a fraction in the known parts of the integer.

RULE.

Multiply the numerator by the number of parts contained in the integer, and divide the product by the denominator, the quotient ſhews the known parts; if there be any remainder multiply it by the next inferior denomination, and divide by the denominator as before; continue this work till you come to the loweſt denomination.

EXAMPLES. (Page 284.)

61. Reduce $\frac{322}{960}$ of a pound to its proper quantity.

```
         322
          20
        ————
960)6440(6s 8½d Anſ.
    5760
    ————
    ·680
      12
    ————
960)8160(8d
    7680
    ————
     480
       4
    ————
960)1920(2qrs
    1920
    ————
```

62. Reduce $\frac{42}{240}$ of a pound to its proper quantity. Anſwer 3s 6d

63. What is the value of $\frac{13}{24}$ of a ſhilling? Anſwer 6½d

64. Reduce $\frac{132}{160}$ of an acre to its proper quantity. Anſwer 3 rood 12 perches

65. Reduce $\frac{68}{112}$ of a cwt. to its proper quantity. Anſwer 2 qrs 12 lb

66. Reduce $\frac{17}{24}$ of a foot to its proper quantity. Anſwer 8½ inches

67. Reduce $\frac{25}{40}$ of a ton to its proper quantity. Anſwer 12½ cwt

68. What is the value of $\frac{3184}{5760}$ of a pound troy? Anſwer 6 oz, 12 dwts, 16 grs

69. Reduce $\frac{22054}{28672}$ of a cwt. to its known value. Anſwer 3 qrs, 2 lb, 2 oz, 6 drs

70. What is the value of $\frac{483}{1394}$ of a moidore? Anſwer 9s 4¼d $\frac{62}{1394}$

ADDI-

ADDITION OF VULGAR FRACTIONS.

RULE.

Reduce all the given fractions, to ſimple ones of the ſame integer and denominator (if not ſo already) then the ſum of the numetators being made a numerator to the common denominator, makes the fractional ſum ſought, which may be further reduced, as ſeems moſt expedient, or the caſe will admit.

EXAMPLES. (Page 286.)

Ex. 1. What is the ſum of $\frac{2}{4}$ and $\frac{3}{4}$?

$$\begin{array}{r} 2 \\ 3 \\ \hline 5 \end{array}$$ Anſ. $\frac{5}{4}$

2. What is the ſum of $\frac{3}{8}$ and $\frac{5}{8}$? Anſwer 1

3. What is the ſum of $\frac{2}{3}$ and $\frac{4}{6}$? Anſwer $\frac{24}{1}$

4. What is the ſum of $\frac{3}{5}$ and $\frac{6}{9}$? Anſwer $\frac{57}{45}$

5. What is the ſum of $\frac{1}{3}$ of $\frac{1}{4}$ and $\frac{3}{8}$? Anſwer $\frac{44}{96}$

6. What is the ſum of $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{1}{4}$ of a ſhilling? Anſwer 2s 2d

7. What is the ſum of $\frac{3}{5}$ of a pound, $\frac{5}{10}$ of a ſhilling, and $\frac{5}{8}$ of a penny? Anſwer 12s $6\frac{1}{2}$d $\frac{96}{192}$

8. What is the ſum of $\frac{201}{460}$ of a pound, and $\frac{1}{4}$ of a ſhilling? Anſwer 8s $11\frac{3}{4}$d $\frac{176}{368}$

9. Add together $6\frac{1}{2}$, $7\frac{3}{4}$, and $8\frac{1}{5}$. Anſwer $22\frac{18}{40}$

10. Add $\frac{3}{4}$ of an hour to $\frac{5}{9}$ of a week. Anſwer $94\frac{3}{36}$

SUBTRAC-

SUBTRACTION OF VULGAR FRACTIONS.

RULE.

Prepare the fractions as directed in Addition; then ſubtract one numerator from the other, and their difference will be a numerator, under which ſubſcribe the common denominator.

EXAMPLES. (Page 288.)

Ex. 1. What is the difference between $\frac{4}{6}$ and $\frac{2}{6}$?

from $\frac{4}{6}$
take $\frac{2}{6}$

$\frac{2}{6}$ Anſ.

2. What is the difference between $\frac{3}{8}$ and $\frac{2}{8}$? Anſ. $\frac{1}{8}$

3. What is the difference between $\frac{18}{25}$ and $\frac{12}{25}$? Anſwer $\frac{6}{25}$

4. What is the difference between $\frac{14}{18}$ and $\frac{9}{18}$? Anſwer $\frac{5}{18}$

5. What is the difference between $12\frac{4}{6}$ and $6\frac{2}{6}$? Anſwer $6\frac{2}{6}$

6. What is the difference between $14\frac{14}{18}$ and $8\frac{4}{18}$? Anſwer $6\frac{10}{18}$

7. What is the difference between $862\frac{12}{28}$ and $224\frac{16}{28}$? Anſwer $637\frac{24}{28}$

8. What is the difference between $961\frac{3}{9}$ and $460\frac{4}{9}$? Anſwer $500\frac{8}{9}$

9. What is the difference between $\frac{3}{8}$ and $\frac{2}{9}$? Anſ. $\frac{11}{72}$

10. What is the difference between $\frac{2}{3}$ of $\frac{8}{9}$ and $\frac{4}{12}$? Anſwer $\frac{84}{324}$

11. What is the difference between 1 and $\frac{16}{24}$? Anſwer $\frac{8}{24}$

12. What is the difference between 64 and $\frac{16}{24}$? Anſwer $63\frac{8}{24}$

MULTIPLICATION OF VULGAR FRACTIONS.

RULE.

Prepare the given numbers (if they require it) by the rules of Reduction; then multiply the numerators together for a new numerator, and the denominators for a new denominator.

EXAMPLES. (Page 289.)

Ex. 1. What is the product of $\frac{2}{3}$ and $\frac{5}{8}$?

$$\frac{2\times5}{3\times8}=\tfrac{10}{24}\text{ Anſwer.}$$

2. What is the product of $\frac{4}{5}$ and $\frac{6}{10}$? Anſ. $\frac{24}{50}$
3. What is the product of $\frac{4}{16}$ and $\frac{5}{26}$? Anſ. $\frac{20}{316}$
4. What is the product of $\frac{3}{4}$ and $\frac{6}{9}$? Anſ. $\frac{8}{36}$
5. What is the product of $7\frac{1}{4}$ and $\frac{3}{4}$? Anſ. $5\frac{7}{16}$
6. What is the product of $3\frac{4}{7}$ and 12? Anſ. $\frac{300}{7}$
7. What is the product of $\frac{3}{4}$, of $\frac{5}{6}$ and 1? Anſ. $\frac{15}{24}$
8. What is the product of $\frac{7}{8}$, of $\frac{3}{4}$, $\frac{2}{5}$, and of $\frac{6}{8}$?
Anſwer $\frac{252}{1280}$
9. What is the product of 12l 6s 8d $\frac{3}{9}$ and 3?
Anſwer £37 0 1
10. What is the product of 6l 12s 4d $\frac{5}{6}$ and 4?
Anſwer £26 9 $7\frac{2}{6}$

DIVISION of VULGAR FRACTIONS.

RULE.

Prepare the fractions as before directed, then multiply the denominator of the diviſor by the numerator of the dividend, for a new numerator; and the numerator of the diviſor into the denominator of the dividend for a new denominator, or invert the diviſor, and proceed as in multiplication.

EXAMPLES.

EXAMPLES. (Page 290.)

Ex. 1. What is the quotient of $\frac{2}{3}$ divided by $\frac{5}{8}$?

$\frac{5}{8})\frac{2}{3}(\frac{16}{15}$ Anſ.

Or thus, by inverting the diviſor, $\frac{8}{5})\frac{2}{3}(\frac{16}{15}$ Anſ. as before.

2. What is the quotient of $\frac{4}{5}$ divided by $\frac{6}{10}$?

Anſwer $\frac{40}{30}$

3. What is the quotient of $\frac{4}{16}$ divided by $\frac{5}{26}$?

Anſwer $\frac{104}{80}$

4. What is the quotient of $\frac{3}{4}$ divided by $\frac{6}{9}$? Anſ. $\frac{27}{24}$

5. What is the quotient of $7\frac{1}{4}$ divided by $\frac{3}{4}$?

Anſwer $\frac{116}{12}$

6. What is the quotient of $3\frac{4}{7}$ divided by 12?

Anſwer $\frac{25}{84}$

7. What is the quotient of $\frac{3}{4}$ of $\frac{5}{6}$ divided by 1?

Anſwer $\frac{15}{24}$

8. What is the quotient of $\frac{7}{8}$ of $\frac{3}{4}$ divided by $\frac{2}{5}$ of $\frac{6}{8}$?

Anſwer $\frac{840}{384}$

9. What is the $\frac{1}{3}$ part of 37l 0s 1d?

Anſwer £12 6 $8\frac{1}{3}$

10. What is the $\frac{1}{4}$ part of 26l 9s 7d $\frac{2}{6}$?

Anſwer £6 12 $4\frac{5}{8}$

THE RULE OF THREE DIRECT IN VULGAR FRACTIONS.

RULE.

Multiply the denominator of your firſt number into the numerators of the ſecond and third, for a new numerator; then multiply the numerator of the firſt number into the denominators of the ſecond and third, for a new denominator, and place it under the new numerators for the anſwer, which reduce to its proper quantity.

EXAMPLES. (Page 290.)

Ex. 1. If $\frac{1}{4}$ of a yard coſt $\frac{2}{3}$ of a pound, what will $2\frac{1}{2}$ yards of the ſame coſt?

$$\begin{array}{ccccc} yd. & & £. & & yd. \\ \frac{1}{4} & : & \frac{2}{3} & :: & \frac{5}{2}=2\frac{1}{2} \end{array}$$

$$\begin{array}{cc} 4 & 1 \\ 2 & 5 \\ \hline 8 & 5 \\ 5 & 2 \\ \hline 40N. & 10D. \end{array}$$

$\frac{40}{10}=\frac{4}{1}=4£.$ the Anſ.

2. If 4l buy $2\frac{1}{2}$ yards of cloth, how many yards of the ſame can I buy for 8 ſhillings? Anſwer $\frac{1}{4}$ yard

3. If $4\frac{3}{4}$ yards coſt 4l 10s, what will $11\frac{1}{2}$ yards coſt? Anſwer 10l $\frac{17}{19}$

4. What is the intereſt of 240l at $4\frac{1}{2}$ per cent? Anſwer 10l 16s

5. If in 10 days I ſpend 1l 15s, how long will 52l 10s laſt me? Anſwer 300 days

6. If in 300 days I ſpend 52l 10s, how much will ſerve me to ſpend 10 days? Anſwer 1l 15s

7. If 72 gallons of French brandy coſt 39l 12s, how many gallons can you buy for 110l? Anſwer 200 gallons

8. If 200 gallons coſt 110l, what will 72 gallons coſt? Anſwer 39l 12s

9. If $\frac{1}{6}$ of a ſhip be worth 249l, what part of her may I buy for 747l? Anſwer $\frac{1}{2}$ of her

10. Sold $40\frac{1}{2}$ ſolid feet of timber for 1l 15s, I demand the price of 50 trees of the ſame timber, each of which contains $24\frac{1}{2}$ ſolid feet? Anſwer £52 18 $7\frac{1}{2}$

11. If $3\frac{1}{2}$ cwt. of ſugar coſt 5l 5s, what will 5 hhds coſt, each weighing net $2\frac{1}{4}$ cwt? Anſwer £16 17 6

12. If $11\frac{1}{4}$ cwt. of ſugar coſt 16l 17s 6d, how much can I buy for 5 guineas? Anſwer $3\frac{1}{2}$ cwt.

THE RULE OF THREE INVERSE IN VULGAR FRACTIONS.

RULE.

Multiply the denominator of the third number into the numerator of the firſt and ſecond for a new numerator; then multiply the numerator of the third number into the denominator of the firſt and ſecond for a denominator, which place under the numerator for the anſwer, and find the proper quantity as before.

EXAMPLES. (Page 293.)

Ex. 1. Suppoſe $2\frac{1}{2}$ yards of cloth, 2 yards wide, make a coat, how many yards of ſhalloon, $\frac{3}{4}$ wide, will line it?

First $2\frac{1}{2}=\frac{5}{2}$. $2=\frac{2}{1}$. then

As $\frac{2}{1} : \frac{5}{2} :: \frac{3}{4}$

$$\begin{array}{cc} 4 & 3 \\ 5 & 2 \\ \hline 20 & 6 \\ 2 & 1 \\ \hline 40\text{N.} & 6\text{D.} \end{array}$$

$\therefore \frac{40}{6}=\frac{20}{3}=6\frac{2}{3}$ yards Anſ.

2. What breadth is that cloth that takes $6\frac{2}{3}$ yards of ſhalloon of $\frac{3}{4}$ wide to line $2\frac{1}{2}$ yards in length thereof?

Anſwer 2 yards broad

3. If an acre of land contains 40 perches in length, and 4 in breadth, what muſt be the length to make an acre, when the breadth is but $16\frac{1}{2}$ yards? Anſwer $293\frac{1}{3}$ yards

4. A lends B $50\frac{2}{3}$l for $6\frac{3}{4}$ months; how long ought B to let A have $21\frac{1}{2}$l to requite his kindneſs?

Anſwer 15 m. 3 w. $4\frac{17}{43}$ days

RULE of FIVE in VULGAR FRACTIONS.

RULE.

Take the continual product of the three laſt, and reciprocals of the two firſt terms, for the anſwer.

EXAMPLES. (Page 294)

Ex. 1. What is the intereſt of 700l for 9 months, at 5 per cent. per annum ?

$$✠\frac{100}{1} : \frac{5}{1} :: \frac{700}{1}.$$

$$✠\frac{12}{1} : \frac{5}{1} :: \frac{9}{1}$$

$$\frac{\frac{700}{1}\times\frac{9}{1}\times\frac{1}{5}}{\frac{100}{1}\times\frac{12}{1}}=\frac{31500}{1200}=26l\ 5s \text{ Anſwer.}$$

2. If 700l. at intereſt for 9 months gain 26l 5s, what will 100l gain in 12 months, at the ſame rate per cent ?

Anſwer 5l

3. If 4 men can do $25\frac{1}{2}$ rods of ditching in 13 days, how many rods may be done by 36 men in 28 days ?

Anſwer $494\frac{4}{13}$ rods

4. Suppoſe the ſalary of 12 perſons for 42 weeks is 240l, what will be the ſalary of 28 perſons for 92 weeks ?

Anſwer £1226 13 4

5. If 3 taylors in $1\frac{1}{2}$ day of 13 hours long, can finiſh 6 ſuits of cloaths, how many taylors in 9 days of the ſame length, and working at the ſame rate, can finiſh 420 ſuits of cloaths ?

Anſwer 35

6. If the carriage of 1 cwt. 20 miles coſt $6\frac{1}{2}$d, what will the carriage of 5 cwt. coſt, being carried 100 miles ?

Anſwer 13s $6\frac{1}{4}$d

DECIMAL

DECIMAL FRACTIONS.

A decimal fraction derives its name from the latin *decem*, *ten*, which denotes the nature of its numbers, repreſenting the parts of any integral quantity divided into a decuple, or tenfold proportion.

NUMERATION,

Teacheth to read or write any number propoſed either by words or characters, according to the following

TABLE.

6	5	4	3	2	1	·2	3	4	5	6
C.M.	X.M.	M.	C.	X.	Units	X. parts	C. parts	M. parts	X.M. parts	C.M. parts

ADDITION OF DECIMALS.

RULE.

Place every figure underneath thoſe of the ſame value, which may be done by placing the ſeparating points exactly one under the other, then find their ſum as in whole numbers, and point off as many places for decimals as are equal to the greateſt number of decimal places in any of the given numbers.

EXAMPLES.

EXAMPLES. (Page 295.)

(1)	(2)	(3)
34·20	6·210	321·3
61·11	7·281	411·3
22·41	6·372	810·0
63·99	4·230	720·9
81·72	3·240	814·5
62·19	7·011	637·2
80·01	4·230	548·1
42·30	8·163	331·2

(4)	(5)	(6)
·324	4·23	23·13
·021	·531	1·8
·423	2·61	6·3
·063	·144	71·01
·27	·621	9·
·414	8·1	·81
·810	4·05	4·23
·540	·801	81·63
·126	·288	1·8
·405	4·131	80·01
·126	1·26	3·6
·801	·144	·9
·513	3·303	9·
·081	·414	40·23
·243	7·101	1·44
·126	·711	60·03
·720	·801	4·23
·144	6·21	·81
·333	3·42	72·
·14	·261	2·34

SUBTRACTION OF DECIMALS.

If your decimals be terminate and complete, place them as in addition, and ſubtract as in whole numbers.

EXAMPLES. (Page 295.)

	(1)	(2)	(3)
From	864·3	58·942	7·6216
Take	421·5	3·641	·0483

	(4)	(5)	(6)
From	9·846	·86491	6947·3
Take	2·013	·21312	2461·9

MULTIPLICATION OF DECIMALS.

RULE.

Multiply the decimals as if they were whole numbers, and from the product cut off as many decimal places as there are in both factors. If there be not ſo many places, ſupply the defect by prefixing cyphers.

EXAMPLES. (Page 296.)

·3046825
·234

12187300
9140475
6093650

71·2957050

(2)
·3046825
23·4

7·12957050

(3)
·431162163
2·48

1·06928216424

(4)
·324637254
·567

·184069323018

(5)
478·216243
12·3456789

5903·9041808423727

(6)
1234·56789
478·216243

590390·41808423727

CONTRACTIONS.

RULE.

1. Tranſpoſe all the figures of the multiplier, in a con-trary order to the common way, viz. let the unit's plac ſtand to the left hand.

2. The unit's place of the multiplier muſt ſtand unde that place of the multiplicand whoſe decimal place you intend to retain in the product.

3. Begin as in common multiplication, always havin regard to the increaſe of that figure on the right hand th figure that ſtands over your multiplier, carrying 1 from 5 t 15; 2 from 15 to 25, &c. making uſe of no more places o your multiplier than thoſe which ſtand even with your multiplicand to the left hand.

EXAMPLES.

EXAMPLES. (Page 297.)

Ex. 1. Multiply ·3046825 by 234· reſerving only two decimals in the product.

.3046825 Multiplicand
432 Multiplier inverted

6093
914
121

71·28 Product

2. Multiply ·3046825 by 23·4, reſerving only two decimals in the product. Anſwer 7·12

3. Multiply ·431162163 by 2·48, reſerving only two decimals in the product. Anſwer 1·06

4. Multiply ·324637254 by ·567, reſerving only three decimals in the product. Anſwer 183

5. Multiply 478·216243 by 12·3456789, reſerving three decimals in the product. Anſwer 5903·899

6. Multiply 1234·56789 by 478·216243, reſerving only the integers in the product. Anſwer 590387

DIVISION OF DECIMALS.

RULE.

Divide as if they were whole numbers, then cut off as many decimal places in the quotient as the number of decimal places in the dividend exceeds the number in the diviſor; if there are not ſo many in the diviſor, prefix ſo many cyphers.

EXAMPLES.

EXAMPLES. (Page 298.)

```
57926)31415926·000(542·345
      289630
      ------
       245292
       231704
       ------
        135886
        115852
        ------
         200340
         173778
         ------
          265620
          231704
          ------
           339160
           289630
           ------
            49530
```

(2) 579·26)31415926(

(3) 57926)3·1415926(

(4) 57·926)31·415296(

(5) ·57926)31415926(

(6) ·57926)3·1415926(

(7) 57926)·31415926(

(8) 5·7926)·31415926(

(9) ·57926)·31415926(

CONTRACTIONS.

RULE.

By the firſt general rule find what place of decimals or integers the firſt figure of the quotient will poſſeſs; conſider how many figures of the quote will ſerve the preſent purpoſe; then take as many of the left hand figures of the diviſor as are equal to the required number of places in the quotient; in dividing, point one figure off the diviſor at each operation, having regard to the increaſe which would ariſe from the igures ſo omitted or pointed off.

EXAMPLES. (Page 300.)

Ex. 1. Divide 12884·9709830 29794 by 412·35678, ſo as to have two decimal places in the quotient.

412·35678)12884·970983029794(31·24
12370

514
412

102
82

20
16

4

2. Divide 5445·418058704098 by 232·14678, ſo as to ave two decimal places in the quotient. Anſwer 23·45

3. Divide 5903·9041808423727 by 12345·6789, ſo as have five decimal places in the quotient. Anſwer ·47821

4. Divide 590390418·08423727 by 4782162·43, ſo as have ſix decimal places in the quotient. Anſ. 123·456789

REDUCTION OF DECIMALS.

CASE I.

To reduce a vulgar ſraction to its equivalent decimal one.

RULE.

Divide the numerator by the denominator, the quotient will be the decimal required.

EXAMPLES. (Page 302.)

Ex. 1. What is the decimal of $\frac{1}{4}$?

$$4)1{\cdot}00$$

$${\cdot}25 \text{ Anſwer.}$$

2. What is the decimal of $\frac{1}{2}$? Anſwer ·5
3. What is the decimal of $\frac{3}{4}$? Anſwer ·75
4. Reduce $\frac{1}{3}$ to a decimal. Anſwer ·333
5. Reduce $\frac{7}{12}$ to a decimal. Anſwer ·583
6. Reduce $\frac{14}{193}$ to a decimal. Anſwer ·072
7. Reduce $6\frac{3}{4}$ to a decimal or mixed number. Anſ. 6·75
8. Reduce $8\frac{4}{12}$ to a decimal or mixed number. Anſwer 8·33
9. Reduce $\frac{226}{3842}$ to a decimal. Anſwer ·058
10. Reduce $\frac{2402}{4806}$ to a decimal. Anſwer ·049

CASE II.

To reduce coins, weights, meaſures, &c. into decimals.

RULE.

Reduce the given money, weight, meaſure, &c. into th lowest denomination or name mentioned for a dividend; the reduce the integer into the ſame denomination for a diviſo the quotient will be the decimal required.

EXAM

EXAMPLES. (Page 304)

Ex. 1. Reduce 4 inches to the decimal of a foot.

12)4·000

·333 Anſ.

2. Reduce 6½ inches to the decimal of a foot. Anſwer ·5416
3. Reduce 10 inches to the decimal of a foot. Anſwer ·833
4. Reduce 5½ inches to the decimal of a foot. Anſwer ·4583
5. Reduce 6 inches to the decimal of a yard. Anſwer ·166
6. Reduce 9½ inches to the decimal of a yard. Anſwer ·263
7. Reduce 220 yards to the decimal of a mile. Anſwer ·125
8. Reduce 660 yards to the decimal of a mile. Anſwer ·375
9. Reduce 18 ſhillings to the decimal of a pound. Anſwer ·9
10. Reduce 16s 9d to the decimal of a pound. Anſwer ·83
11. Reduce 8 ounces to the decimal of a pound troy. Anſwer ·666
12. Reduce 6 dwts. to the decimal of a pound troy. Anſwer ·025
13. Reduce 14 pounds avoirdupoiſe to the decimal of a cwt. Anſwer ·125
14. Reduce 6 ounces avoirdupoiſe to the decimal of a pound. Anſwer ·375
15. Reduce 70 gallons to the decimal of a ton. Anſ. ·27
16. Reduce 90 days to the decimal of a year. Anſwer ·2465
17. Reduce 9 hours to the decimal of a day. Anſ. ·375
18. Reduce 8 minutes to the decimal of a day. Anſwer ·0055

19. Reduce 4 quarts 1 pint of ale to the decimal of a barrel.
Anſwer ·035

20. Reduce 26 poles to the decimal of an acre.
Anſwer ·162

CASE III.

To find the value of any decimal fraction, in money, weight, meaſure, &c.

RULE.

Multiply the given decimal by the parts of the next inferior denomination, and cut off towards the right hand of the product as many figures as there are places in the given decimal, and thoſe on the left will be integers; then multiply the remaining decimals by the next inferior denomination, and cut off for decimals as before; thus proceed till you have brought it to the loweſt parts of the integer.

EXAMPLES. (Page 306)

Ex. 1. What is the value of ·333 of a foot?

$$\begin{array}{r} \cdot333 \\ 12 \\ \hline \text{Inches } 4\cdot000 \text{ Anſ.} \end{array}$$

2. What is the value of ·5416 of a foot?
Anſwer 6½ inches

3. What is the value of ·833 of a foot?
Anſwer 10 inches

4. What is the value of ·4583 of a foot?
Anſwer 5½ inches

5. What is the value of ·166 of a yard? Anſ. 6 inches

6. What is the value of ·263 of a yard? Anſ. 9½ inches
7. What is the value of ·125 of a mile?
Anſwer 220 yards
8. What is the value of ·375 of a mile?
Anſwer 660 yards
9. What is the value of ·9 of a pound ſterling?
Anſwer 18s
10. What is the value of ·83 of a pound? Anſ. 16s 7d
11. What is the value of ·666 of a pound troy?
Anſwer 8 ounces
12. What is the value of ·025 of a dwt. troy?
Anſwer 6 dwts.
13. What is the value of ·125 of a cwt? Anſ. 14lb
14. What is the value of ·375 of a pound avoirdupoiſe?
Anſwer 6 ounces
15. What is the value of ·27 of a ton of wine?
Anſwer 68·05 gal.
16. What is the value of ·2465 of a year?
Anſwer 89·9725 days
17. What is the value of ·375 of a day? Anſ. 9 hours
18. What is the value of ·005 of a day? Anſ. 7 minutes
19. What is the value of ·035 of a barrel of ale?
Anſwer 8·96 pints
20. What is the value of ·162 of an acre?
Anſwer 25·92 poles

Decimal Tables of Coin, Weights, and Meaſures.

TABLE I.

COIN.

1£. Ster. the Integer

Sh.	*dec.*	*Sh.*	*dec.*
19	·95	9	·45
18	·9	8	·4
17	·85	7	·35
16	·8	6	·3
15	·75	5	·25
14	·7	4	·2
13	·65	3	·15
12	·6	2	·1
11	·55	1	·05
10	·5		

Pence.	*Decimals.*
11	·045833
10	·041666
9	·0375
8	·033333
7	·029166
6	·025
5	·020833
4	·016666
3	·0125
2	·008333
1	·004166

Farth.	*Decimals.*
3	·003125
2	·002083
1	·001042

TABLE II.

TROY WEIGHT.

1lb. the Integer.

Ounces.	*Decimals.*
11	·916666
12	·833333
9	·75
8	·666666
7	·583333
6	·5
5	·416666
4	·333333
3	·25
2	·166666
1	·083333

Note, This Table of oz. will alſo ſerve for inches, months, or doz.

Penny weights.	*Decimals.*
10	·041666
9	·0375
8	·033333
7	·029166
6	·025
5	·020833
4	·016666
3	·0125
2	·008333
1	·004166

Grains.	*Decimals.*
20	·003472
10	·001736
9	·001562
8	·001389
7	·001215
6	·001042
5	·000868
4	·000694
3	·000521
2	·000347
1	·000173
½	·000086

TABLE III.

AVOIRDUPOISE.

112lb. the Integer.

Qrs.	*Decimals.*
1	·25
2	·5
3	·75

Pounds.	*Decimals.*
20	·178571
10	·089286
9	·080357
8	·071428
7	·0625
6	·053571
5	·044643
4	·035714
3	·026786
2	·017857
1	·008928

Ounces.	*Decimals.*
10	·00558
9	·005022
8	·004464
7	·003906
6	·003348
5	·00279
4	·002232
3	·001673
2	·001116
1	·000558

Drams.	*Decimals.*
10	·000348
9	·000313
8	·000279
7	·000244
6	·000209
5	·000174
4	·000139

Decimal Tables of Coin, Weights, and Meaſures.

3	·000104
2	·000069
1	·000034
	·000027

TABLE IV.

AVOIRD. WEIGHT

1lb. the integer.

Ounces.	*Decimals.*
8	·5
7	·4375
6	·375
5	·3125
4	·25
3	·1875
2	·125
1	·0625

Drams.	*Decimals.*
8	·03125
7	·027343
6	·023437
5	·019531
4	·015625
3	·011718
2	·007812
1	·003906

TABLE V.

LIQUID MEASURE

1 ton the integer.

Gallons.	*Decimals.*
100	·396825
90	·357141
80	·317462
70	·27
60	·238095
50	·198412
40	·15873
30	·119047
20	·079365
10	·039682
9	·035714
8	·031746
7	·027
6	·023809
5	·019841
4	·015873
3	·011904
2	·007936
1	·003968

Pints.	*Decimals.*
4	·001984
3	·001488
2	·000992
1	·000496

A hogſhead the Integer.

Gallons.	*Decimals.*
30	·47619
20	·31746
10	·15873
9	·142857
8	·126984
7	·111111
6	·095238
5	·079365
4	·063492
3	·047619
2	·031746
1	·015873

Pints.	*Decimals.*
3	·005952
2	·003968
1	·001984

TABLE VI.

MEASURE.

LIQUID. *DRY.*

1 gallon, 1 quarter.
Integer.

Pints.	*Decim.*	*Buſh.*
4	·5	4
3	·375	3
2	·25	2
1	·125	1

Q.pt.	*Decim.*	*Pec.*
3	·09375	3
2	·0625	2
1	·03125	1

Decimals.	*Q. Pk.*
·023437	3
·015615	2
·007812	1

Decimals.	*Pints.*
·005859	3
·003906	2
·001953	1

TABLE VII,

LONG MEASURE.

1 mile the integer.

Yards.	*Decimals.*
1000	·568182
900	·511364
800	·454545
700	·397727
600	·340909
500	·284091
400	·227272
300	·170454
200	·113636
100	·056818
90	·051136
80	·045454
70	·039773
60	·054091
50	·028409
40	·022727
30	·017045
20	·011364

Decimal Tables of Coin, Weights, and Meaſures.

10	·005682
9	·005114
8	·004545
7	·003977
6	·003409
5	·002841
4	·002273
3	·001704
2	·001139
1	·000568

Feet.	*Decimals.*
2	·0003787
1	·0001894

Inch.	*Decimals.*
6	·0000947
3	·0000474
2	·0000315
1	·0000158

TABLE VIII.

TIME.

1 year the integer.

Days.	*Decimals.*
300	·821918
200	·547945
100	·273963
90	·246575
80	·219178
70	·191781
60	·164383
50	·136986
40	·109589
30	·082192
20	·054794
10	·027397
9	·024657
8	·021918
7	·019178
6	·016438
5	·013699
4	·010959
3	·008219
2	·005479
1	·002739

1 day the integer.

Hours.	*Decimals.*
20	·833333
10	·416666
9	·375
8	·333333
7	·291666
6	·25
5	·208333
4	·166666
3	·125
2	·083333
1	·041666

Minute.	*Decimals.*
50	·034722
40	·027777
30	·020833
20	·013888
10	·006944
9	·00625
8	·005555
7	·004861
6	·004166
5	·003472
4	·002777
3	·002083
2	·001388
1	·000694

TABLE IX.

CLOTH MEASURE.

1 yard the integer.

Quart.	*Decimals.*
3	·75
2	·5
1	·25

Nails.	*Decimals.*
3	·1875
2	·125
1	·0625

TABLE X.

LEAD WEIGHT.

1 futher the integer.

Hund.	*Decimals.*
10	·51282
9	·461538
8	·410256
7	·358974
6	·307692
5	·25641
4	·205128
3	·153846
2	·102564
1	·051282

Qurs.	*Decimals.*
2	·025641
1	·01282

Pounds.	*Decimals.*
14	·0064102
13	·0059523
12	·005494
11	·0050366
10	·0045787
9	·0041208
8	·003663
7	·0032051
6	·0027472
5	·0022893
4	·001831
3	·0013736
2	·0009157
1	·0004578

EXTRACTION OF THE SQUARE ROOT.

RULE.

1. Begin at the units place and point the given numbers into periods of two figures each, both on the left and right hand of the ſeparating point, the whole numbers muſt be pointed from right to left, the decimals the contrary way.

2. Find the greateſt ſquare that is contained in the firſt period towards the left hand and ſet the root in the quotient, and ſubtract the ſquare from the figures of that period.

3. To the remainder bring down the two figures under the next point for a dividend.

4. Double the quotient for a diviſor, and ſee how often it is contained in the dividend (reſerving the units place) and put the anſwer in the quotient, and alſo on the right hand of the diviſor, then multiply the diviſor by the laſt figure put in the quotient, and ſubtract the product from the dividend, to the remainder bring down the next period, and proceed thus till all the periods are brought down; if any thing remain add two cyphers thereto and repeat the work, and for every pair of cyphers you had you will have one decimal in the root.

EXAMPLES. (Page 309.)

Ex. 1. What is the ſquare root of 144?

```
     . .
     144(12 root
     1
     ---
22)  44
     44
     ---
```

2. Let it be required to extract the ſquare root of 1728.
Anſwer 41.56

3. What is the ſquare root of 3456? Anſwer 58

4. Extract the ſquare root of 49864. Anſwer 223
5. Extract the ſquare root of 345678. Anſwer 587·94
6. What is the ſquare root of 4567893? Anſwer 2137
7. What is the ſquare root of 123456789? Anſwer 11111·11106
8. What is the ſquare root of 987654·321? Anſwer 993·807990006
9. What is the ſquare root of ·123456789123456789? Anſwer ·35136560606219953269435

SQUARE ROOT of VULGAR FRACTIONS.

RULE.

Reduce the *fraction* or *fractional* parts to their loweſt terms, and if a mixed number, to an improper fraction; then extract the ſquare root of the numerator for a new numerator, and the ſquare root of the denominator for a new denominator.

EXAMPLES. (Page 313.)

Ex. 1. What is the ſquare root of $\frac{9}{16}$?
Anſwer $\surd\frac{9}{16}=\frac{3}{4}$

2. What is the ſquare root of $\frac{16}{25}$? Anſwer $\frac{4}{5}$
3. What is the ſquare root of $\frac{36}{49}$? Anſwer $\frac{6}{7}$
4. What is the ſquare root of $\frac{64}{81}$? Anſwer $\frac{8}{9}$
5. What is the ſquare root of $\frac{144}{196}$? Anſwer $\frac{12}{14}$
6. What is the ſquare root of $6\frac{1}{4}$? Anſwer $\frac{5}{2}=2\frac{1}{2}$

SURDS.

Are numbers or fractions whoſe root can never be exactly found.

RULE.

RULE.

Reduce the fraction or fractional parts to their loweſt terms, then reduce them to decimals, and annex thoſe decimals to the whole numbers, if any, and extract the root therefrom.

To find the fractional part of the root of a whole number nearly, make twice the remainder a numerator; and add 1 to 4 times the root for a denominator.

EXAMPLES. (Page 313.)

Ex. 1. What is the ſquare root of $\frac{96}{120}$?
First $\frac{96}{120}=\frac{4}{5}$ in its lowett
terms? and $\frac{4}{5}$ reduced
to a decimal $=\cdot 8$

$$
\begin{array}{rl}
 & \dot{}\;\;\dot{}\;\;\dot{} \\
 & \cdot 800000(\cdot 894 \text{ Anſ.} \\
 & 64 \\
\hline
169) & 1600 \\
 & 1521 \\
\hline
1784) & 7900 \\
 & 7136 \\
\hline
 & 764
\end{array}
$$

2. What is the ſquare root of $38\frac{3}{4}$? Anſwer 6·22
3. What is the ſquare root of $86\frac{1}{2}$? Anſwer 9·3
4. What is the ſquare root of $462\frac{9}{12}$? Anſwer 21·51
5. What is the ſquare root of 26? Anſwer $5\frac{2}{21}$

USE OF THE SQUARE ROOT.

CASE I.

To find a mean proportional between any two given numbers.

RULE.

RULE.

Multiply the two given ſides together, and extract the ſquare root of the product, which root will be a mean proportional ſought.

EXAMPLES. (Page 314.)

Ex. 1. What is the mean proportional between 18 and 32?

32
18

256
32

· ·
576(24 Anſ.
4

44)176
176

2. I have a piece of timber whoſe breadth is 20 inches, and depth 12 inches, what is the ſide of a ſquare equal thereto? Anſwer 15·49

3. A gentleman has a piece of ground whoſe length is 6 chains, and breadth 4 chains, which he intends to change for a ſquare piece of the ſame area, you are required to find the length of the ſide? Anſwer 4·898

4. What is the geometrical mean between 12½ inches, and 18½ inches? Anſwer 15·2

5. Suppoſe the tranſverſe diameter of an ellipſis be 40 and conjugate diameter 30, what is the diameter of a circle equal thereto? Anſwer 34·6

CASE II.

To find the ſide of a ſquare equal in area to any given ſuperficies.

RULE.

RULE.

Extract the ſquare root of the given ſuperficies, which root will be the ſide of the ſquare ſought.

EXAMPLES. (Page 316.)

Ex. 1. If the area of a circle be 576, what is the ſide of a ſquare whoſe ſuperficial content is equal thereto?

```
  .  .
  576(24 Anſ.
  4
  ---
44)176
   176
   ---
```

2. The area of a triangle is 240 feet, what is the length of one ſide of a ſquare equal in area to the triangle?
Anſwer 15·49

3. The area of a certain piece of ground is 24 ſquare chains, what is the ſide of the ſquare that bound it?
Anſwer 4·89

4. If the content of a circle be 231·25, what is the ſide of a ſquare equal thereto? Anſwer 15·2

CASE III.

Having the area of a circle to find the diameter.

RULE.

As 355 : 452 :: or as 1 : 1·2732, ſo is the area to the ſquare of the diameter: or multiply the ſquare root of the area by 1·12837, and the product will be the anſwer.

EXAMPLES. (Page 317.)

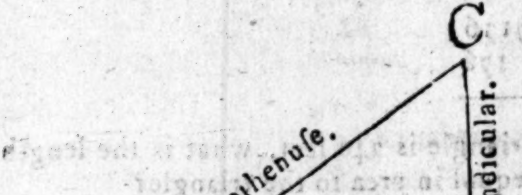
Ex. 1. What is the diameter of a circle whoſe area is 576 ſquare inches? Anſwer 27·09 diam.

2. What is the diameter of a circle whoſe area is ·7854? Anſwer 1

3. What is the diameter of a circular waiter, whoſe area is $38\frac{1}{2}$ inches? Anſwer 7 inches

4. The area of one end of a circular piece of timber is 363·05 inches, what is the diameter? Anſwer 21·499 inches

CASE IV.



Any two ſides of a right angled triangl A B C being given t find the other ſide; th baſe and perpendicula being given to find th hypothenuſe.

RULE.

The ſquare root of the ſum of the ſquares of the baſe an perpendicular, is the length of the hypothenuſe.

EXAMPLES. (Page 318.)

Ex. 1. Suppoſe the baſe A B be 48, and perpendicula B C be 20 yards, what is the length of the hypothenuſe? Anſwer 52 yard

The baſe and hypothenuſe being given to find the perpendicular.

RULE.

The ſquare root of the difference of the ſquares of th hypothenuſe and baſe, is the height of the perpendicular?

2. Suppo

2. Suppoſe the baſe A B 48 yards, and the hypothenuſe A C 52, required the perpendicular? Anſwer 20 yards

The hypothenuſe and perpendicular being given to find the baſe.

RULE.

The ſquare root of the difference of the ſquares of the hypothenuſe and perpendicular is the length of the baſe.

3. Suppoſe the hypothenuſe A C 52 yards, and perpendicular B C 20, required the baſe? Anſwer 48 yards

4. There is a tower whoſe height is 30 yards, which is ſurrounded by a moat 40 yards broad, what length muſt a ladder be to reach from the outſide of the moat to the top of the tower? Anſwer 50 yards

5. Two ſhips ſailed from the ſame port, one of them ſails eaſt 40 leagues, the other north, till her diſtance from the other ſhip be 60 leagues, I demand how far the ſecond ſhip ſailed? Anſwer 44 leagues

6. There is a may-pole whoſe top end was broken off, which ſtruck the ground at 15 feet diſtance from the foot of the pole, the broken piece was 25 feet, what was the length of the may-pole before this accident happened?

Anſwer 45 feet

The ſum ſpent by the company, to find out the number of perſons, and what they ſpent a-piece.

RULE.

The ſquare root of the whole ſum ſpent, reduced to the loweſt denomination, is the number of perſons, and what they ſpent a-piece, in the ſame denomination, the ſum is reduced to.

7. A company of men drinking till the reckoning came to 13s 0¼d; I demand how many there were in company, and what they paid a-piece?

Anſwer 25 men paid 6¼d each

8. A company of men ſpent at a feaſt the ſum of 11l 5s 4d, I deſire to know how many they were in company, and what they paid a-piece? Anſwer 52 men ſpent 4s 4d each

9. Suppoſe 321489 ſoldiers were ordered into a ſquare battalia, how many muſt there be in rank and in file?

Anſwer 567 men

To know what light is proper for any room.

RULE.

Multiply the length, breadth, and height together, the ſquare root of that ſum is the quantity of light required.

10. Suppoſe a room was 24 feet long, 16 broad, and 14 high, how much light would be proper for this room?

Anſwer 73·3 feet

Having the bung and head diameters of a caſk given to find the length of the diagonal line.

RULE.

Add the ſquare of half the ſum of the head and bung diameters, to the ſquare of half the length; the ſquare root of that ſum is the diagonal of the caſk.

11. Let the bung be 26, head diameter 22, and length of the caſk 30 inches, what is the diagonal line?

Anſwer 28·3 inches

EXTRACTION of the CUBE ROOT.

RULE.

Point every third figure of the given number, beginning at the units; then find the neareſt cube to the firſt point, ſubtract it therefrom, and put the root in the quotient, bring down the figures in the next point to the remainder for a reſolvend.

2. Square the quotient and multiply it by 3 for a diviſor. find how often it is contained in the reſolvend, rejecting units and tens, and put the anſwer in the quotient.

3. Square this new figure, and put it on the right hand of the diviſor; but if the new figure ſhould be 1, 2, or 3, then put 01, 04, or 09 to the right hand.

4. Multiply the laſt figure in the quotient by 30, and alſo by the former figures; add this product to the diviſor, and multiply the ſum by the laſt figure in the quotient; ſubtract that product from the reſolvend, bring down the next point, and proceed as before.

To carry on decimals in the root, add triple cyphers to the reſolvend, and for proof cube the root, and take in the remainder, if any.

EXAMPLES. (Page 322)

Ex. 1. What is the cube root of 1728?

$$\begin{array}{rl}
 & \dot{1}72\dot{8}(12\text{ the root.}\\
 & 1\\ \cline{2-2}
304 & \\
60 & 728\\
364) & 728\\ \cline{2-2}
\end{array}$$

2. What is the cube root of 2197? Anſwer 13
3. What is the cube root of 2744? Anſwer 14
4. What is the cube root of 2985984? Anſwer 144
5. What is the cube root of 75686967? Anſwer 423
6. What is the cube root of 644972544? Anſwer 864
7. What is the cube root of 50243409? Anſwer 369
8. What is the cube root of 12862247607? Anſwer 2343
9. What is the cube root of 163039787847? Anſwer 5463
10. What is the cube root of 50023150823736? Anſwer 36 46
11. What is the cube root of 94996712418949125? Anſwer 456285

12. What is the cube root of 94997087172244118016? Anſwer 4562856
13. What is the cube root of 3·46? Anſwer 1·51
14. What is the cube root of 50375·533? Anſwer 36·9
15. What is the cube root of 163040·819968? Anſwer 54·63
16. What is the cube root of 8151·613? Anſwer 20·12
17. What is the cube root of ·01286226891? Anſwer ·2343
18. What is the cube root of 163·04? Anſwer 5·463

To extract the Cube Root of Vulgar Fractions.

RULE.

Reduce the fraction to its loweſt terms, and extract the cube root of the numerator for a new numerator, and the cube root of the denominator for a new denominator.

If a mixed number to an improper fraction; and if a *ſurd* to a decimal. To find the fractional part of the cube root of a whole number, make twice the remainder a numerator, and add three times the root to ſix times its ſquare for a denominator.

EXAMPLES. (Page 326.)

Ex. 1. What is the cube root of $\frac{8}{27}$?

$\sqrt[3]{\frac{8}{27}}=\frac{2}{3}$ the root.

9. What is the cube root of $\frac{27}{64}$? Anſwer $\frac{3}{4}$
3. What is the cube root of $\frac{512}{729}$? Anſwer $\frac{8}{9}$
4. What is the cube root of $\frac{27}{125}$? Anſwer $\frac{3}{5}$
5. What is the cube root of $\frac{72}{243}$? Anſwer $\frac{2}{3}$
6. What it the cube root of $\frac{108}{256}$? Anſwer $\frac{1}{4}$
7. What is the cube root of $3\frac{3}{8}$? Anſwer $1\frac{1}{2}$
8. What is the cube root of $91\frac{1}{8}$? Anſwer $4\frac{1}{2}$

THE

THE USE OF THE CUBE ROOT.

CASE I.

To find the ſide of a cube equal in ſolidity to any given ſolid.

RULE.

The cube root of the ſolid content of the given body will be the ſide of the cube required.

EXAMPLES. (Page 327.)

Ex. 1. The ſolid content of a cubical ſtone is 2197 ſolid inches, what is the ſuperficial content of one of its ſides?

$\dot{2}19\dot{7}$)13 inches Anſwer.
1

399)1197
1197

2. The content of a globe is 2744 ſolid inches, what is the ſide of a cube equal thereto? Anſwer 14 inches

CASE II.

The dimenſions of any ſolid body being given to find the dimenſions of a ſimilar ſolid of a different capacity.

RULE.

As the cube of a dimenſion is to its given weight, ſo is the cube of any like dimenſion to the weight ſought.

EXAMPLES. (Page 327.)

3. If an iron ball, 4 inches diameter, weigh 9lb. what will an iron ball of 7 inches diameter weigh?

$$\begin{array}{rcrr} 4 & & & 7 \\ 4 & & & 7 \\ \hline 16 & & & 49 \\ 4 & & & 7 \\ \hline 64 & : & 9 \;::\; & 343 \\ & & & 9 \\ \hline \end{array}$$

$$64\begin{cases} 8)\,3087{\cdot}000 \\ 8)\;\;385{\cdot}875 \end{cases}$$

lb. 48·234 Anſ.

4. If a ſhip of 500 tons burthen be 80 feet long in the keel, I demand the burthen of another ſhip whoſe keel is 100 feet long? Anſwer 976·56 tons

5. Suppoſe a cylinder, whoſe diameter is 40 inches, depth 20 inches, and content 89·1 ale gallons; and it were required to make another of the ſame form that would contain 100 gallons, what muſt its dimenſions be?

Anſwer 41·5 diam. 20·78 depth

CASE III.

Having the dimenſions of any ſolid body, to find the dimenſions of another ſimilar ſolid that ſhall be any number of times greater or leſs than the ſolid given.

RULE.

Multiply the cube of each ſide by the difference between the ſolid given and that required, if greater (or divide by the difference, if leſs) than the ſolid given, then extract the cube root of each product or quotient, which will give the dimenſions of the ſolid required.

EXAMPLES.

EXAMPLES. (Page 330.)

6. There is a cube whoſe ſide is 5 feet, I demand the ſide of another cube, whoſe ſolid content is double the former?

```
          5
          5
          -
         25
          5
        ---
        125
          2
        ---
          .
        250(6·29=6·3 nearly
        216
        ----
11164) 34000
       22328
       -------
170021)11672000
       10530189
       --------
        1141811
```

7. Suppoſe another cube whoſe ſide is 6·3 feet, I demand the dimenſions of another of the ſame form whoſe ſolid content is half as much as the former? Anſwer 5·0 feet

8. Suppoſe the length of a ſhip's keel to be 250 feet, the breadth of the midſhip beam 50 feet, and the depth of the hold 30 feet; I demand the dimenſions of another ſhip of the ſame form that ſhall carry only half the burthen.

Anſwer 198 keel, 39 midſhip beam, 23·8 depth in the hold

CASE IV.

To find two mean proportionals between two given numbers.

RULE.

RULE.

Divide the greater extreme by the leſs, and the cube root of the quotient multiplied by the leſs extreme, gives the leſſer mean; multiply the ſaid cube root by the leſſer mean, the product will be the greater mean proportional.

EXAMPLES. (Page 332.)

9. What are the two mean proportionals between 4 and 108?

4)108

27(3 Cube Root
4
12 Leſſer mean
3
36 Greater mean

As 4 : 12 :: 36
12
4)432
108 Proof

10. What are the two mean proportionals between 4 and 500?
Anſwer 20 leſſer, 100 greater mean

To extract the Roots of Powers in general.

RULE.

1. Prepare the given number for extraction, by pointing off from the unit's place as the root required directs.
2. Find the firſt figure of the root by trial, and ſubtract its power from the given number.
3. To the remainder bring down the firſt figure in the next period, and call it the dividend.
4. Involve the root to the next inferior power to that which is given, and multiply it by the number denoting the given power for a diviſor.
5. Find how many times the diviſor may be had in the dividend, and the quotient will be another figure of the root.

6. Involve the whole root to the given power, and ſubtract it from the given number as before.

7. Bring down the firſt figure of the next period to the remainder for a new dividend, to which find a new diviſor, and ſo on till the whole is finiſhed.

EXAMPLES. (Page 332.)

Ex. 1. What is the cube root of 75686967?

75686967(423 root
$64=4^3$

$4^2\times3=48$) 116 dividend

$74088=42^3$

$42^2\times3=5292$) 15989 ſecond dividend

75686967

2. What is the biquadrate root of 32015587041?
Anſ. 423 root

3. Extract the ſur ſolid, or fifth root of 13542593318343.
Anſ. 423 root

4. Extract the ſixth root of 5728516973659089.
Anſ. 423 root

5. Find the ſeventh root of 2423162679857794647.
Anſ. 423 root

6. Find the eighth root of 1024997813579847135681.
Anſ. 423 root

7. Find the ninth root of 433574075144275338393063.
Anſ. 423

THE

THE SINGLE RULE OF THREE IN DECIMALS.

RULE.

Reduce vulgar fractions to decimals, and compound numbers either to decimals of the higheſt names, or to integers of the loweſt, as alſo the firſt and third to the ſame name; then ſtate the queſtion, and proceed as in integers.

EXAMPLES. (Page 335.)

Ex. 1. If $\frac{1}{4}$ of a yard of cloth coſt $\frac{2}{5}$ of a pound, what will $2\frac{1}{2}$ yards coſt?

First $\frac{1}{4}$=·25, $\frac{2}{5}$=·4£. and $2\frac{1}{2}$=2·5 yards; then

yds. *£.* *yds.*
As ·25 : 4 :: 2·5
·4
——
·25)1·00(4£. Anſ.
100
——

2. If 4l will buy $2\frac{1}{2}$ yards of cloth, how many yards of the ſame can I buy for 8s? Anſwer $\frac{1}{2}$yd.

3. If $4\frac{3}{4}$ yards coſt 4l 10s, what will $11\frac{1}{2}$ yards coſt; Anſwer 10·89l

4. What is the intereſt of 240l at $4\frac{1}{2}$l per cent? Anſwer £10 16 0

5. If in ten days I ſpend 1l 15s, how long will 52l 10s laſt me? Anſwer 300

6. If in 300 days I ſpend 52l 10s, how much will ſerve me to ſpend 10 days? Anſwer £1 15 0

7. If 72 gallons of French brandy coſt 39l 12s, how much can be bought for 110l? Anſwer 200

8. If 200 gallons of French brandy coſt 110l, what will 72 gallons coſt? Anſwer £39 12 0

9. If an acre of land contain 40 perches in length and 4 in breadth, what muſt be the length to make an acre, when the breadth is but $16\frac{1}{2}$ yards? Anſwer 293·33

10. If $\frac{1}{6}$ of a ſhip be worth 249l, what part of her can I buy for 747l? Anſwer ·4998 = $\frac{1}{9}$ of her

11. Sold 40$\frac{1}{2}$ ſolid feet of timber for 1l 15s, I demand the price of 50 trees of the ſame timber, each of which contains 24$\frac{1}{2}$ ſolid feet Anſwer 52·932l

12. If 3$\frac{1}{2}$ cwt. of ſugar coſt 5l 5s, what will 5 hhds. coſt, each weighing net 2$\frac{1}{4}$ cwt? Anſwer 16·875l

13. If 11$\frac{1}{4}$ cwt. of ſugar coſt 16l 17s 6d, how much can I buy for 5 guineas? Anſwer 3·5 cwt

14. Suppoſe I buy 2$\frac{1}{2}$ yards of cloth, 2 yards wide, to make a coat, how many yards of ſhalloon $\frac{3}{4}$ yard wide will line it? Anſwer 6·66 yards

15. What breadth is that cloth which takes 6$\frac{2}{3}$ yards of ſhalloon of $\frac{3}{4}$ yard wide to line 2$\frac{1}{2}$ yards in length thereof? Anſwer 1·99 = 2 yards nearly

16. Suppoſe a deal 14 feet long, 3 inches thick, and 11 inches broad, weigh 120lb. or 1 cwt. I demand the weight of 50 deals 20 feet long, 2$\frac{1}{2}$ inches thick, and 11 inches broad? Anſwer 7142·857lb

RULE OF FIVE IN DECIMALS.

The ſame preparations muſt be made here as before directed in the Rule of Three, after which proceed as in integers.

EXAMPLES. (Page 342.)

Ex. 1. What is the intereſt of 700l for 9 months, at 5 per cent. per annum?

```
    £.      £.     £.
 *100  :    5  ::  700
 * 12 mon.——————9 month
 ————         ————
 12·00         6300
                  5
             ——————
          12)315·00
             ——————
           £26·25=26l. 5s.
```

2. If 700l in nine months gain 26l 5s intereſt, what will 100l gain in 12 months at the ſame rate per cent?

Anſwer 5l per cent.

3. If 4 men can do 25½ rods of ditching in 13 days, how many rods may be done by 36 men in 28 days?

Anſwer 494·3 rods

4. Suppoſe the ſalary of 12 perſons for 42 weeks is 240l, what will be the ſalary of 28 perſons for 92 weeks?

Anſwer 1226·666l

5. If 3 taylors in 1½ day of 13 hours long can finiſh 6 ſuits of clothes, how many taylors in 9 days of the ſame length, and working at the ſame rate, can finiſh 420 ſuits of clothes?

Anſwer 35

6. If the carriage of 1 cwt. 20 miles coſt 6½d, what will the carriage of 5 cwt. coſt being carried 100 miles?

Anſwer 13s 6½d

SINGLE FELLOWSHIP.

RULE.

Divide the whole gain or loſs by the whole ſtock, the quotient will be a common multiplier, by which multiply every man's part of the ſtock, the ſeveral products will be the reſpective gain or loſs of each.

EXAMPLES

EXAMPLES. (Page 344)

Ex. 1. Two partners, A and B, make a ſtock of 224l, A puts in 96l, and B 128l, they gain 28l by trade, what is the gain of each?

```
           £.
A puts in  96
B         128
         ———£. gain
         224)28·000(·125 the common multiplier.
             224
             ———
             560        96        128  A gains 12l.
             448      ·125       ·125  B  ——  16
             ———      ————       ————     ————
            1120       480        640  Proof 28l.
            1120      192        256
            ————      96        128
                      ——————    ——————
                      12·000    16·000
```

2. Three perſons make a joint ſtock; A puts in 1500l, B 900l, and C 600l, with which they trade a certain time and gain 600l, what is the ſhare of each?

Anſwer, A gains 300l, B 180l, C 120l

3. Three merchants trading to America, loſt Goods to the value of 1600l. now if A's ſtock was 2400l, B's 9600l, and C's 4000l, what ſum did each man loſe?

Anſwer, A loſes 240l, B 960l, C 400l

4. It is required to divide 480l between three perſons, ſo that their ſhares ſhall be to each other as 1, 2, and 3, reſpectively? Anſ. 1ſt perſon's ſhare 80l, 2nd 160l, 3d 240l

5. Three creditors, A, B, and C, gave credit to a tradeſman who became a bankrupt, worth only 920l, A credited him for 520l, B for 680l, and C for 800l, what muſt each of theſe creditors receive from the bankrupt for their ſeveral debts?

Anſ. A 239l 4s, B 312l 16s, C 368l

6. Four merchants, A, B, C, and D, make a joint adventure of 1900l to North America; A ſent goods to the value of 360l, B 480l, C 500l, and D 600l; in three years time they gain 970l, required each perſon's ſhare of the profit?

Anſ. A's ſhare 180l, B's 240l, C's 250l, D's 300l.

7. Four merchants, A, B, C, and D, in partnerſhip together, and with one common ſtock of 1940l gained as follows, viz. A 180l, B 240l, C 250l, and D 300l, what was each man's ſtock?

Anſ. 360l A's ſtock, B's 480l, C's 500l, D's 600l.

8. Three factors together purchaſe an Eaſt India ſloop, towards which A advanced $\frac{3}{7}$, B $\frac{3}{8}$, and C 120l, how much paid A and B, and what part of the veſſel had C, is required, with the purchaſe of the whole ſloop?

Anſwer, C's part was $\frac{11}{56}$
A paid £261 16 4$\frac{1}{4}$
B paid 229 1 9$\frac{1}{4}$
Sloop coſt 610 8 2

DOUBLE FELLOWSHIP.

RULE.

Divide the whole gain or loſs by the ſum of all the products, the quotient will be a common multiplier, by which multiply the product of each man's ſtock and time, and each product will be the reſpective ſhare of the loſs or gain.

EXAMPLES.

EXAMPLES. (Page 348.)

Ex. 1. Two merchants, A and B, engage in partnerſhip, A puts in 96l for 4 months, and B 128l for 6 months; they trade and gain 24l, what is the gain of each merchant?

Firſt $96\times4=384$ A's ſtock and time
$128\times6=768$ B's ſtock and time

$1152)24{\cdot}00000({\cdot}02083$ common multiplier

Then $384\times{\cdot}02083=\ 7{\cdot}99872$ A's gain
$768\times{\cdot}02083=15{\cdot}99744$ B's gain

Proof £$23{\cdot}99616=24$l. very nearly.

2. A and B have a common ſtock of 224l, A gains 8l in 4 months, B 16l in 6 months, what was each of their particular ſtocks? Anſ. A's ſtock 96l, B's ſtock 128l.

3. Three merchants, A, B, and C, traded together, A put in 240l for 8 months, B 500l for 4 months, and C 200l for 5 months, they gained 369l; what is each man's ſhare of the gain? Anſ A's ſhare 144l, B's 150l, C's 75l.

4. Two merchants together make up a ſtock of 1200l, A's ſtock continued in company 9 months, and B's 11, they gain 400l, which they divide equally; how much did each put in? Anſ. A put in 660l, B 540l.

5. Three merchants trade together with one common ſtock, as follows:—A puts in 50l for 4 months, and then puts in 80l more for 3 months; B puts in 60l for 6 months, and then takes out 40l for 4 months; C puts in 100l ſtock for 6 months, and then takes out 50l for 5 months; they gained 362l, what muſt each perſon receive of the gain for his ſhare? Anſ. A receives 113·575l, B 84·7l, C 163·625l

6. Four merchants, A, B, C, and D, entered into partnerſhip, thus:—A put in 64l 10s for $4\frac{1}{2}$ months; B put in 78l 15s for 6 months; C put in 112l 14s for $8\frac{3}{4}$ months; and D 125l 5s for $5\frac{1}{4}$ months; they gain 108l 18s $4\frac{1}{2}$d, what muſt each merchant receive of the gain?

Anſ.	A muſt receive	13·137l
	B	21·3859l
	C	44·633l
	D	29.762l

SIMPLE INTEREST.

RULE.

Multiply the principal ratio and time together, and it will give the intereſt required.

TABLE OF RATIOS.

at	3 per cent. is	·03
	$3\frac{1}{2}$	·035
	4	·04
	$4\frac{1}{2}$	·045
	5	·05

Note. Ratio is the ſimple intereſt of 1l for 1 year, at any rate per cent. agreed on, and is thus found:

As 100*l*. : 3 :: 1 : ·03 ratio. As 100 : 5 :: 1 : ·05

EXAMPLES. (Page 350.)

Ex. 1. What is the intereſt of 364l for one year, at 5 per cent. per annum?

£.
364 Principal
·05 Ratio

18·20=18l. 4s. Anſ.

2. What is the intereſt of 486l for 5 years, at 5 per cent. per annum? Anſwer 121l 10s

3. What is the intereſt of 884l for 7 years, at 5 per cent. per annum? Anſwer 309l 8s

4. What is the intereſt of 1001l for 6 years, at 4½ per cent. per annum? Anſwer 270l 5s 4¾d

5. What is the intereſt of 1205l for 6 months, at 4 per cent. per annum? Anſwer 24l 2s

6. What is the intereſt of 640l 8s 4d for 7 years, at 5 per cent. per annum? Anſwer 224l 2s 11d

7. What is the intereſt of 9640l 16s 8d for 4 years and 9 months, at 5 per cent. per annum?

Anſwer 2289l 13s 11½d

When the intereſt required is for days only.

RULE.

Multiply the intereſt of 1l for one day, at the given rate, by the principal and number of days for the anſwer.

TABLE.

Per cent.		Decimals:
3	=	·00008219178
3½	=	·00009589041
4	=	·00010958904
4½	=	·00012328767
5	=	·00013698630

The intereſt of 1l for one day is thus found:

As 365 : ·05 :: 1 : ·0001369863, &c.

8. What is the intereſt of 641l for 50 days, at 5 per cent. per annum?

·0001369863 intereſt of 1l for 1 day.
641 principal.

1369863
5479452
8219178

·878082183
50 number of days.

4·3904109150=4l 7s.9½d Anſwer.

9. What is the intereſt of 2000l for 63 days, at 4½ per cent. per annum? Anſwer £15 10 8

10. What is the amount of 5800l 16s 8d for 260 days, at 4 per cent. per annum? Anſwer £5966 2 4

11. What is the intereſt of 563l 12s 6½d for 265 days, at 5 per cent. per annum? Anſwer £20 9 2½d

When the rate, time, and intereſt are given to find the principal.

RULE.

Divide the intereſt by the product of the rate and time, the quotient is the principal.

12. What principal being put to intereſt for 5 years will gain 12l at 4 per cent. per annum?

Years.
5 time.
·04 ratio.

·20)12·00(60£. Anſwer.
120

00

13. I demand what principal being put to intereſt for 4 years, will gain 124l at 5 per cent. per annum?
Anſwer 620l

14. What principal being put to intereſt for 3 years, will gain 69l 13s 6d at 5 per cent. per annum? Anſ. 464l 10s

15. What principal being put to intereſt for 4½ years, will gain 58l 14s 6d at 4 per cent. per annum?
Anſwer 326l 5s

When the amount, rate, and time are given to find the principal.

RULE.

Multiply the ratio by the time, add 1 to the product for a diviſor, by which ſum divide the amount, the quotient will be the principal.

16. What principal will amount to 72l in 5 years, at 4 per cent. per annum?

```
     ·04 ratio.
      5 time.
   ——————
     ·20
  +1·
  ——————
 1·20)72·00(60l. Anſwer.
       720
       ———
        00
       ———
```

17. What principal being put to intereſt will amount to 744l in 4 years, at 5 per cent. per annum? Anſ. 620l

18. What principal will amount to 534l 3s 6d in 3 years, at 5 per cent. per annum? Anſwer 464l 10s

19. What principal being put to intereſt will amount to 384l 19s 6d in 4½ years, at 4 per cent. per annum?
Anſwer 326l 5s

When the principal, intereſt, and rate are given to find the time.

RULE.

RULE.

Divide the intereſt by the product of the principal and ratio; the quotient is the time.

20. In what time will 60l gain 12l at 4 per cent. per annum?

principal 60
ratio ·04

2·40)12·00(5 years Anſwer.
1200

21. In what time will 620l gain 124l at 5 per cent. per annum? Anſwer 4 years

22. In what time will 464l 10s gain 69l 13s 6d at 5 per cent. per annum? Anſwer 3 years

23. In what time will 326l 5s gain 58l 14s 6d at 4 per cent. per annum? Anſwer 4½ years

When the amount, principal, and rate are given to find the time.

RULE.

Divide the amount leſs the principal, by the product of the principal and rate, the quotient is the time.

24. In what time will 60l amount to 72l at 4 per cent. per annum?

£.	£.
60	72 amount
·04	60 principal
2·40)	12·00(5 years Anſwer.
	1200

25. In what time will 620l amount to 744l at 5 per cent. per annum? Anſwer 4 years

26. In what time will 464l 10s amount to 534l 3s. 6d at 5 per cent. per annum? Anſwer 3 years

27. In what time will 326l 5s amount to 384l 19s 6d at 4 per cent. per annum? Anſwer 4·5 years

When the principal, intereſt, and time are given to find the rate per cent.

RULE.

Divide the intereſt by the product of the principal and time, the quotient is the rate.

At what rate per cent. will 60l gain 12l in 5 years?

£.
60 principal
time 5 years
—— intereſt
300)12·00(·04=4 per cent.
1200
——

29. At what rate per cent. will 620l gain 124l in 4 years? Anſwer 5l per cent.

30. At what rate per cent. will 464l 10s gain 69l 13s 6d in 3 years? Anſwer 5l per cent.

31. At what rate per cent. will 326l gain 58l 14s 6d in 4½ years? Anſwer 4l per cent.

When the principal, amount, and time are given to find the rate.

RULE.

Take the difference between the amount and principal, and divide it by the product of the principal and time, the quotient is the rate.

32. At what rate per cent. will 60l amount to 72l in 5 years?

principal 60 72 amount
time 5 60 principal
—— ——
300)12·00(·04=4 per cent. Anſ.
1200
——

33. At what rate per cent. will 620l amount to 744l in 4 years? Anſwer 5l per cent.

34. At what rate per cent. will 464l 10s amount to 534l 3s 6d in 3 years? Anſwer 5l per cent.

35. At what rate per cent. will 326l 5s amount to 384l 19s 6d in $4\frac{1}{2}$ years? Anſwer 4l per cent.

DISCOUNT.

RULE.

As the amount of 1l for the given time is to 1l, ſo is the intereſt of the debt to the diſcount required.

Ex. 1. What is the diſcount of 120l for 1 year at 5 per cent. per annum?

ratio ·05
time 1

·05
+1·

1·05 amount of 1l for the given time.

120
·05

6·00 intereſt of the debt.

---

1 ·05 : 1 :: 6
6
1·05)6·00000(5·714=5l 14s $3\frac{1}{4}$d.
525
750
735
150
105
450
420
30

2. Sold goods to the value of 50l. to be paid in 1 year, what muſt be diſcounted for preſent payment, allowing diſcount at 5 per cent. per annum? Anſwer £2 7 7¼

3. What preſent money will diſcharge a debt of 200l. payable at the end of one year, diſcount being made at 5 per cent? Anſwer £190 9 6½

4. How much ready money for a note of 36l. due 3 months hence, diſcount at 5 per cent?
Anſwer £35 11 1½

5. What is the diſcount of 573l. 16s. due 3 years hence, diſcount at 4½ per cent? Anſwer £68 4 11¾

6. What preſent money will diſcharge a debt of 130l. due 1 year and 9 months hence, diſcount at 4⅜ per cent. per annum? Anſwer £120 15 1¼

7. How much preſent money muſt be allowed for a bill of 399l. 13s. 4d. payable in 73 days, diſcount being made at 5 per cent. per annum? Anſwer £395 14 2½

COMPOUND INTEREST.

RULE,

1. Find the amount of 1l. for one year at the given rate per cent.

2. Involve the amount thus found to ſuch a power as is denoted by the number of years.

3. Multiply this power by the principal or given ſum, and the product will be the amount required.

4. Subtract the principal from the amount, and the remainder will be the intereſt.

The amount of 1l. for one year is thus found:

As 100 : 104 :: 1 : 1·04=the amount at 4 per cent.
As 100 : 104·5 :: 1 : 1·045=the amount at 4½ per cent.
As 100 : 105 :: 1 : 1·05=the amount at 5 per cent.
As 100 : 105·5 :: 1 : 1·055=the amount at 5½ per cent.

EXAMPLES. (Page 361.)

Ex. 1. What is the amount of 50l. for 3 years, at 5 per cent. per annum compound intereſt?

$$
\begin{array}{r}
1·05\\
1·05\\
\hline
525\\
105\\
\hline
1·1025\\
1·05\\
\hline
55125\\
110250\\
\hline
1·157625\\
50\\
\hline
\end{array}
$$

57·881250=57l. 17s. 7½d. the amount.

2. What is the amount of 100l. for 4 years, at 5 per cent. per annum? Anſwer £121 11 0½

3. What will 100l. amount to in 3 years, at 5 per cent. per annum, ſuppoſing the intereſt payable half yearly?
Anſwer £115 19 4½

4. What will 100l. the intereſt payable quarterly, amount to in 1½ year, at 5 per cent. per annum, compound intereſt?
Anſwer £107 14 9

5. What is the compound intereſt of 450l. forborn 5 years, at 5 per cent. per annum? Anſwer £97 9 11½

ARITHMETICAL PROGRESSION.

Any rank of numbers that increaſe by a common exceſs o decreaſe by a common difference, are ſaid to be in arithme tical progreſſion; as 1, 2, 3, 4, 5, &c. and 9, 7, 5, 3, 1 &c.

The numbers which form the ſeries are called the terms o the progreſſion.

An

Any three of the five following terms being given, the other two may be found.

1. The firſt term
2. The laſt term
3. The number of terms
4. The common difference
5. The ſum of all the terms.

PROBLEM 1.

The firſt term, the laſt term, and the number of terms being given to find the ſum of all the terms.

RULE.

Multiply the ſum of the extremes by the number of terms, and half the product is the anſwer.

EXAMPLES. (Page 365.)

Ex. 1. The firſt term of an arithmetical progreſſion is 2, the laſt term 56, and the number of terms 19, required the ſum of the ſeries?

56 greater extreme
2 leſſer ditto

58 ſum
19 number of terms

2)1102

Anſ. 551 ſum of the ſeries.

2. The firſt term is 3, the laſt term 33, and the number of terms 11, required the ſum of the ſeries?

Anſwer 198

3. A man bought 7 yards of cloth, and gave for the firſt yard 3s. and for the laſt 27s. what did the 7 yards amount to?

Anſwer 5l. 5s.

4. If 60 ſtones are placed in a right line, exactly a yard aſunder, and the firſt a yard from a baſket; what length of ground will that man go who gathers them up ſingly, returns with them one by one to the baſket?

Anſwer 1 mile 70 yards.

PROBLEM 2.

The firſt term, the laſt term, and the number of terms, being given to find the common difference.

RULE.

Divide the difference of the extremes by the number of terms leſs 1, the quotient will be the common difference ſought.

EXAMPLES. (Page 365.)

Ex. 1. The extremes are 2 and 56, and the number of terms 19, required the common difference?

$$\begin{array}{rl} 19 & 56 \\ 1 & 2 \\ \hline 18) & 54(3 \text{ common difference} \\ & 54 \\ \hline \end{array}$$

2. If the extremes be 3 and 33, and the number of terms 11, it is required to find the common difference?

Anſwer 3 common difference.

3. If a perſon buys 7 yards of cloth, and gives for the firſt yard 3s. and for the laſt 27s. what is the common difference of the price of each yard?

Anſwer 4s. difference per yard.

4. The extremes of an arithmetical progreſſion are 1 and 60, and the number of terms 60, quere the common difference? Anſwer 1.

PROBLEM

PROBLEM 3.

Given the firſt term, the laſt term, and the common difference to find the number of terms.

RULE.

Divide the difference of the extremes by the common difference, the quotient increaſed by 1 is the number of terms required.

EXAMPLES. (Page 366.)

Ex. 1. The extremes are 2 and 56, and the common difference 3; what is the number of terms?

```
  56
   2
 ----
3)54
 ----
  18
   1
 ----
  19 Anſwer.
```

2. If the extremes be 3 and 33, and the common difference 3, what is the number of terms? Anſwer 11

3. Suppoſe I buy a quantity of cloth, and give for the firſt yard 3s. and for the laſt 27s. the common difference of the price of each yard is 4s. required the number of yards? Anſwer 7

4. If the extremes of an arithmetical progreſſion be 1 and 60, and the common difference 1, what is the number of terms? Anſwer 60

PROBLEM 4.

Given the laſt term, the number of terms, and common difference, to find the firſt term.

RULE.

Multiply the number of terms leſs 1 by the common difference; the product ſubtracted from the laſt term leaves the firſt.

EXAMPLES. (Page 367.)

Ex. 1. The laſt term is 33, the number of terms 11, and common difference 3, what is the firſt term?

11 number of terms
1

10
3 difference

30
33 laſt term

Anſ. 3 firſt term

2. If the laſt term be 56, the number of terms 19, and common difference 3, what is the firſt term? Anſwer 2

3. A man bought 7 yards of cloth, the laſt yard of which coſt him 27s. the common difference of the price of each yard was 4s. how much did he give for the firſt yard? Anſwer 3s.

GEOMETRICAL PROGRESSION,

Is when any rank or ſeries of numbers increaſe by one common multiplier, or decreaſe by one common diviſor.

As 4, 8, 16, 32, &c. here the common multiplier or ratio is 2.

And 81, 27, 9, 3, &c. here the common diviſor or ratio is 3.

PROBLEM 1.

Given the firſt term, the laſt term, and the ratio, to find the ſum of the ſeries.

RULE.

RULE.

Multiply the laſt term by the ratio, and from the product ſubtract the firſt term, the remainder divided by the ratio, leſs 1 will give the ſum of the ſeries.

EXAMPLES. (Page 367.)

Ex. 1. The firſt term of a ſeries in geometrical progreſſion is 1, the laſt term is 65611, and the ratio 3; what is the ſum of the ſeries?

```
                  65611
                      3
                 ------
                 196833
                      1
                 ------
ratio 3—1=2)196832
                 ------
                  98416 Anſwer.
```

2. The extremes of a geometrical progreſſion are 2 and 8192, and the ratio 2; what is the ſum of the ſeries? Anſwer 16382

3. The extremes of a geometrical ſeries are 1 and 2048, and the ratio 2, what is the ſum of the ſeries? Anſ. 4095

4. A farmer ſold 8 buſhels of wheat, and received for the firſt buſhel 2 farthings, and for the laſt 32768 farthings, the ratio or increaſe of each buſhel is 4; what was the 8 buſhels ſold for? Anſwer 43690 qrs.=£45 10 2½

PROBLEM II.

Given the firſt term, the ratio, and number of terms, to find any other term aſſigned.

RULE.

1ſt. Find a few of the leading terms, over which place their indices.

2. Find what figures of the indices when added together will give the index of the term wanted.

3. Multiply the numbers ſtanding under ſuch indices into each other, the laſt product will be the term required.

4. In any ſeries not proceeding from unity, proceed as above, only obſerve to divide every product by the firſt term. The firſt term of the indices muſt begin with a cypher, except that term be equal with the ratio, and in that caſe the indices muſt begin with an unit; and when the indices begin with a cypher, the ſum of the indices made uſe of muſt be leſs by 1 than the number of terms given.

EXAMPLES. (Page 368.)

Ex. 1. Suppoſe a man agrees for nine fat oxen, to pay only the price of the laſt, reckoning 1l. for the firſt, 2l. for the ſecond, &c. doubling the price to the laſt, what was the price of the oxen?

$$\text{Firſt}\left\{\begin{array}{l} 0.\ 1.\ 2.\ 3.\ 4.\ 5.\ \text{indices} \\ 1.\ 2.\ 4.\ 8.16.32.\ \text{terms} \end{array}\right.$$

And $4+3=8$ the numbers of terms, leſs 1.
Alſo $16\times16=256$£. the anſwer.

2. A ſum of money was to be divided amongſt 13 perſons, the firſt to have 2l. the ſecond 4l. &c. increaſing by two to the laſt, what muſt he receive? Anſwer 8192l.

3. What debt will be diſcharged in 12 months, by paying 1s. the firſt month, 2s. the ſecond, 4s. the third, and ſo on, each ſucceeding payment being double the laſt, and what will the laſt payment be?

Anſ. debt is 204l. 15s. and the laſt payment 102l. 8s.

4. A gentleman bequeathed to his 8 children the whole of his eſtate in the following manner, viz. to the youngeſt child 2l. to the next youngeſt 8l. and ſo on, every child's fortune to exceed the next younger in a quadruple proportion, how much muſt the eldeſt receive, and what was the whole of the teſtator's eſtate?

Anſ. 32768l. eldeſt's part; 43690l. whole eſtate.

PERMU-

PERMUTATION,

Is the ſhewing how many different ways any given number of things may be changed, ſo that no two parcels may have all their quantities placed in the ſame ſituation.

RULE.

Multiply all the terms of the natural ſeries of numbers, from 1 up to the given number, continually together, the laſt product will be the anſwer required.

EXAMPLES. (Page 370.)

Ex. 1. How many changes may be rung on 8 bells?
Anſ. 1×2×3×4×5×6×7×8=40320.

2. For how many days can 9 perſons be placed in a different poſition at dinner? Anſ. 362880 days.

3. Six ſcholars taken out of a free ſchool to be ſent to the Univerſity, were to be entertained there for a certain ſum of money with two meals a day, ſo long and no longer, than, that ſitting altogether on a form at every meal, they might ſit in a contrary poſition; the queſtion is how long they were to ſtay there, and how many poſitions may be made by them?
Anſ. 720 poſitions, 360 days to ſtay.

4. How many changes may be made of the words in the following ſentence, "Doctores, elementia velint ut dicere prima?" Anſwer 720 changes.

SINGLE POSITION,

Teacheth to reſolve ſuch queſtions as cannot be reſolved by any of the former rules, the reſults of which are proportional to their ſuppoſition.

RULE.

Take any fit number, and perform the ſame operations with it as are to be performed in the queſtion, then ſay, as the falſe number reſulting is to the true number given, ſo is the whole or any part of the falſe number to the whole or reſpective part of the number ſought.

EXAMPLES. (Page 371.)

Ex. 1. Three men, A, B, and C, purchaſe a ſhip for 440l. B paid twice as much as A, and C 4 times as much as B, how much did each man pay?

Suppoſe A paid 60l.
then B muſt pay 120
and C 480
ſum 660

Then as 660 : 60 :: 440
60
£.
660)26400(40 A's ſhare.
conſequently $40\times2=80$ B's ſhare.
and $80\times4=320$ C's ſhare.

£ 440 Proof.

2. It is required to divide 60 crowns amongſt three perſons, A, B, and C, ſo that A may have $\frac{1}{2}$, B $\frac{1}{3}$, and C $\frac{1}{5}$; quere each man's ſhare?

Anſwer, A's ſhare $29\frac{2}{62}$l. B's $19\frac{22}{62}$l. C's $11\frac{38}{62}$l.

3. A perſon, after ſpending $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$ of his money, had 104l. left, how much had he at firſt? Anſwer 480l.

4. A perſon delivered to another a ſum of money unknown to receive ſimple intereſt for the ſame at 5 per cent. per annum, and at the end of 12 years he received for principal and intereſt 500l. what was the ſum lent? Anſwer 312l. 10s.

5. A can do a piece of work in 12 days, B can do the ſame in 8 days, and C in 6 days, how long will it take them all to do the ſame piece of work? Anſwer $2\frac{2}{3}$ days.

DOUBLE POSITION,

Teacheth to reſolve queſtions, by making two ſuppoſitions of falſe numbers.

RULE.

1. Take any two convenient numbers, and proceed with each according to the conditions of the queſtion.

2. Find how much the reſults are different from the reſult in the queſtion.

3. Multiply each of the errors by the contrary ſuppoſition, and find the ſum and difference of the products.

4. If the errors are alike, that is, both greater or both leſs than the given number, take their difference for a diviſor, and the difference of their products for a dividend, but if unlike, that is, one too much and the other too little, then take their ſum for a diviſor, and the ſum of their products for a dividend, the quotient will be the anſwer.

EXAM-

EXAMPLES. (Page 374.)

Ex. 1. A man had 900 ſheep, but by ſeveral loſſes they are very much reduced, for at one time he loſt $\frac{1}{2}$ as many as he now hath; at another time $\frac{1}{3}$ as many; and the third time $\frac{1}{4}$ as many; how many hath he now left?

First, ſuppoſe he had	12	Second, ſuppoſe	24
the $\frac{1}{2}$ is	6	the $\frac{1}{2}$ =	12
$\frac{1}{3}$ is	4	$\frac{1}{3}$ =	8
$\frac{1}{4}$ is	3	$\frac{1}{4}$ =	6
ſum	25	ſum	50
ſhould be	900	ſhould be	900
1ſt error—	875	2d error—	850
2d ſup.	24	1ſt ſup.	12
	3500		10200
	1750		

errors { 875 | 21000
errors { 850 | 10200

25)10800(432 Anſwer.
100
80
75
50
50

he hath 432 now left
the $\frac{1}{2}$ is 216
$\frac{1}{3}$ is 144
$\frac{1}{4}$ is 108
900 proof.

2. It is required to divide 300l. between two perſons, A and B, in ſuch proportion that A may have 72l. more than B, what is each perſon's ſhare?

Anſwer, A's ſhare is 186l. B's 114l.

3. Two perſons, A and B, diſcourſing of their money, ſays A, if you will give me 50l, I ſhall have as much as you; ſays B, if you will give me 44l, I ſhall have twice as much as you; how much had each perſon?

Anſwer A had 232l, B 376l

4. Two men, A and B, performed a piece of work in 30 days, for which they received 3l 14s, A's wages was 2s 8d a day, and B's 2s 2d a day, how many days did each work?

Anſwer A worked 18 days, B 12 days

5. A, B, and C, are indebted to D, who hath forgotten their particular debts, but remembered that A and B's debts together was 100l, C and B's 160l, and the debt of A and C together was 140l, what is each man's particular debt?

Anſwer A's debt 40l, B's 60l, C's 100l.

6. An ornament with eaſe you'll find,
From what is underneath ſubjoined;
Which greatly doth become the fair,
In every ſeaſon of the year.

The name of the ornament is compoſed of three letters in the alphabet, the firſt letter's place is three times that of the ſecond, the third is five times that of the firſt, + 1, and the ſum of all the three letters' places is 20.

S MISCELLANEOUS

MISCELLANEOUS QUESTIONS.

Queſt. 1. There are two numbers, the leaſt whereof is 80, and their difference 28, what is the greater number, and ſum of both?
Anſwer 108 greater no. 188 ſum of both

2. A ſheep-fold was robbed three nights ſucceſſively, the firſt night half the ſheep were ſtolen and half a ſheep more; the ſecond night half the remainder were loſt and half a ſheep more; the laſt night they took half what were left and half a ſheep more, by which time they were reduced to twenty, how many were there at firſt?
Anſwer 167 ſheep at firſt

3. From the creation to the flood was 1656 years; thence to the building of Solomon's temple 1336 years; thence to Mahomet, who lived 622 years after Chriſt, 1630 years; in what year of the world was Chriſt then born?
Anſwer A. M. 4000

4. A is 13 years younger than B, and 17 years older than C, who in the year 1765 was known to be 24 years of age; how old was each of theſe perſons in 1787?
Anſwer C 46, A 63, and B 76 years

5. If the mean diſtances between the earth and ſun be 81 million of miles, and between the earth and moon 240 thouſand, how far are thoſe two luminaries aſunder in an eclipſe of the ſun, when the moon is lineally between the earth and ſun, and in another of the moon, when the earth is in a line between her and him?
Anſwer, In an eclipſe of the moon 81240000 miles
In an eclipſe of the ſun 80760000 miles

6. The building of Solomon's temple was in the year of the world 3000. Troy was, by computation, built 443 years before the temple, and 260 years before London; now Carthage was built 113 years before Rome, founded 744 years before Chriſt, born anno mundi 4000; is London or Carthage the ancienteſt city, and how much?
Anſwer London was built before Carthage 326 years

7. Two men, A and B, enter into partnerſhip, and afte ſome time A had diſburſed 17l 3s 3d, B had paid 10l 10s, they are now indebted 10l 13s, and from the beginning o thei

their partnerſhip they are to pay equal, query what has each now to pay of the debt?

Anſwer A has to pay £4 19 10½
B - - - 11 13 1½

8. The ſemidiameter of the earth's orbit, or annual path round the ſun in the centre of the Syſtem, is about 81000000 miles, that of Venus 59000000, when they are both on the ſame ſide the ſun, they are in peregæo, when on different ſides, in apogæo, what is the difference of their diſtances in both theſe circumſtances?

Anſwer 118000000 miles

9. What number taken from the ſquare of 46, will leave 12 times 32? Anſwer 1732

10. What ſum of money muſt be divided amongſt 12 men, ſo that they may receive 18l 6s 4½d each?

Anſwer £219 16 6

11. What difference is there between twice thirty five, and twice five and thirty? Anſwer 30

12. The remainder of a diviſion ſum is 20, the quotient 423; the diviſor is the ſum of both and 19 more; what then was the number to be divided?

Anſwer 195446

13. There are two numbers, the greateſt of them is 73 times 109, and their difference 17 times 28, what is their ſum and product?

Anſwer 15438 ſum, and 59526317 their product

14. By induſtry a merchant, in ten years, found himſelf poſſeſſed of 13000l, it appeared from his books, that the laſt three years he had cleared 873l a year, the three preceding but 586l, and before that but 364l a year, you are required to find how much he had to begin with, and how much he gained?

Anſwer 5833l gained, 7167l to begin with

15. A perſon dying, left his widow the uſe of 10000l, to a charity he bequeathed 1693l, to each of his three nephews 2460l, to each of his four nieces 2100l, to twenty poor houſekeepers ten guineas each, and 400 guineas to his executors, what muſt he have died poſſeſſed of?

Anſwer 28103l

16. What number added to the 43d part of 4429 will make the ſum 240? Anſwer 137

17. What number deducted from the 26th part of 2262 will leave the 87th part of the ſame? Anſ. 61

18. What number multiplied by 72084 will produce 5190048 exactly? Anſ. 72

19. My purſe and money, quoth Dick, is worth 12s. 8d. but the money is worth 7 times the purſe, pray what was there in it? Anſ. 11s. 1d.

20. A, B, and C, play a concert at hazard, and at making up accounts, it appears that A and B together brought off 13*l*. 10s. B and C together 12l. 12s. and A and C together won 11l. 16s. 6d. what did they ſeverally get?

Anſ. C got £5 9 3
A 6 7 3
B 7 2 9

21. If the $\frac{1}{3}$ of 6 be 3, what will the $\frac{1}{4}$ of 20 be?

Anſ. $7\frac{1}{2}$

22. A perſon was poſſeſſed of $\frac{3}{5}$ ſhare of a copper mine, and ſold $\frac{3}{4}$ of his intereſt therein for 1710l. what was the reputed value of the whole property at the ſame rate?

Anſ. 3800l.

23. A clock hath two hands or pointers, the firſt, A, goes round once in 12 hours, the ſecond, B, once in an hour; now if they both ſet forward together, in what time will they meet again? Anſ. 1 hour $5\frac{5}{11}$ min.

24. There is an iſland 73 miles in circumference, and 3 footmen all ſtart together, to travel the ſame way about it. A goes 5 miles a day, B 8, and C 10, when will they all come together again? Anſ. 5329 days.

25. Water runneth into a ciſtern by a pipe that will fill it in 8 hours, and runneth out by another that will empty it in 22 hours, in what time, both running together, will the ciſtern be full? Anſ. $12\frac{4}{7}$ hours.

26. If the ſun moves every day one degree, and the moon 13, and at a certain time the ſun being at the beginning of Cancer, and in three days after the moon in the beginning of Aries, the place of their next following conjunction is required? Anſ. $10\frac{3}{4}$ degrees of Cancer.

27. A gentleman has an eſtate of 400l. per annum, but will have it divided into two farms, in proportion to each other as 3 to 5, what is the yearly value of each?

Anſ. 150l. 250l.

28. The ſum of 2000l. is to be divided amongſt three men in ſuch a manner that if A has 3l. B ſhall have 5l. and C 8l. how much muſt each man have?

Anſwer, A 375l. B 625l. and C 1000l.

29. Three workmen can do a piece of work in certain times, viz. A can do it in three weeks, B can do thrice the work in 8 weeks, and C 5 times the work in 12 weeks; in what time can they finiſh it jointly?

Anſwer, 5 days 4 hours.

30. A is man enough to do a certain piece of work in an hour, B can do as much in 3 hours, C as much in 5 hours, and D as much in 7 hours; in what time can they do three times the work, all working together?

Anſwer, 1 hour 47 min. $23\frac{2}{11}$ ſec.

31. Suppoſing the earth to be 81000000 miles diſtant from the ſun; I would know at what diſtance from him another body muſt be placed, ſo as to receive light and heat double to that of the earth? Anſwer, 57275649 miles.

32. A bullet of caſt iron, 4 inches diameter, weighs experimentally 9lb. what is the difference of the weight of one that is $13\frac{1}{2}$ inches in diameter, and another that is no more than $7\frac{1}{2}$ inches? Anſwer, $13\frac{1}{2}$lb.

33. Suppoſe a ſtone let go into an abyſs, ſhould be ſtopped at the end of the eleventh ſecond after its delivery, what ſpace would it have gone through?

Anſwer, 1946·083 feet.

N. B. The velocity acquired by heavy bodies falling near the ſurface of the earth, is $16\frac{1}{12}$ feet in the firſt ſecond; and as $16\frac{1}{12}$ feet are to the ſquare of one ſecond, or 1, ſo is the given diſtance to the ſquare of the ſeconds required.

Or by multiplying $16\frac{1}{12}$, the deſcent of a heavy body in one ſecond of time, by as many of the odd numbers, beginning from unity as there are ſeconds in the given time; viz. by 1 for the firſt, 3 for the ſecond, 5 for the third, 7 for the fourth, &c. the ſum total will give the ſpace it hath paſſed.

34. In what time would a muſket ball dropped from the top of Saliſbury ſteeple, ſaid to be 400 feet high, be at the bottom? Anſwer, 4·987, or 5 ſeconds nearly.

35. If 4 longitude ſtudents in 40 days of 14 hours long,

can calculate one nautical ephemeris, in how many days of 10 hours long, can 12 of the ſame ſort of ſtudents calculate the ſame ephemeris, to find out the longitude for a year?

Anſwer, $18\frac{2}{3}$ days.

36. My water tub holds 147 gallons, the pipe uſually brings in 14 gallons in 9 minutes, the tap diſcharges at a medium 40 gallons in 31 minutes; ſuppoſing theſe both careleſsly to be left open, and the water to be turned on at two o'clock in the morning, the ſervants at five finding the water running, ſhuts the tap, and are ſolicitous to know in what time the tub will be filled after this accident, in caſe the water continues flowing from the main?

Anſwer, 3 min. $48\frac{228}{434}$ ſec. after 6 o'clock.

37. If a ciſtern or reſervoir of water 25 feet high, with a pipe of 1 inch diameter, in 40 hours diſcharges 1000 hogſheads of water, how many hogſheads will a ciſtern 16 feet high, diſcharge with a pipe of 2 inches diameter, in 24 hours? Anſwer, 1920 hhds.

38. A, B, and C made a ſtock to trade with, and all laid in together 560l. they trade and gain 150l. at the end of their partnerſhip, A took up 40l. B 50l. and C 60l. what had each man in ſtock?

Anſwer, A $149\frac{1}{3}$l.
B $186\frac{2}{3}$l.
C 224l.

39. A in company with B and C put into ſtocks 168l. for 5 months, B put in a ſum of money for 8 months, and C 400l. for a certain time; they gain 90l. whereof A muſt have 18l. B 12l. and C 60l. how much was the ſtock of B, and what time did the ſtock of C continue in company?

Anſ. B's ſtock was 70l. C's ſtock continued 7 months.

40. The joint ſtock of A and B gained them after the rate of 20l. per cent. per annum, 50l. a-piece; A had 400l. in ſtock, and the ſtock of B continued but 5 months, what money had B in ſtock, and how long did A continue in company?

Anſ. A continued $7\frac{1}{2}$ months, B put into ſtock 600l.

41. It is required to divide 300 acres of land amongſt A, B, C, and D, whoſe eſtates are 100l. 300l. 600l. and 1000l. reſpectively per annum, and the value of the land allotted

to each is 5, 8, 12, and 15 ſhillings an acre; what number of acres muſt each perſon have?

Anſwer, A muſt have	34·45 acres.
B	64·593 do.
C	86·124 do.
D	114·832 do.

42. A, B, and C are to ſhare 100,000l. in the proportion of $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$ reſpectively, but C's part being loſt by his death, it is required to divide the whole ſum equitably between the other two?

Anſ. A's part is	$57142\frac{282}{329}$l.
B's	$42857\frac{47}{329}$l.

43. Four merchants, A, B, C, and D, gain 2000l. by trade, whereof half of A's ſhare is equal to $\frac{3}{4}$ of B's, $\frac{4}{5}$ of C's, and $\frac{5}{6}$ of D's, what ſhare had each?

Anſwer, A's ſhare	$691\frac{223}{347}$l.
B's	$461\frac{33}{347}$l.
C's	$432\frac{96}{347}$l.
D's	$414\frac{342}{347}$l.

44. If 12 oxen eat up $3\frac{1}{3}$ acres of paſture in 4 weeks, and 21 oxen eat up 10 acres of like paſture in 9 weeks, how many oxen will eat up 24 acres in 18 weeks, the graſs being allowed to grow uniformly? Anſwer 36

45. A ſelect company dining at a tavern, the reckoning amounted to 13s. a-piece; but three of them ſlinking away, the reſt had 6s. 6d. a-piece more to pay; quere the number of perſons at firſt? Anſwer 9

46. Suppoſing a cow to bring forth a ſhe-calf at the age of two years, and then to continue yearly to do the ſame, and every one of her brood to bring forth a ſhe-calf at the age of two years, and afterwards yearly likewiſe, how many may ſpring from the old cow and her brood in 40 years?

Anſwer, 165580140 increaſe required.

47. Suppoſe a man to have a calf, which at the end of three years begins to breed, and afterwards a female calf every year; and that each calf begins to breed in like manner at the end of three years, bring forth a cow-calf every year, and that theſe laſt breed in the ſame manner, &c. &c. to determine the owner's whole ſtock at the end of 20 years?

Anſwer, 1278 the whole ſtock required.

APPENDIX.

Containing various Forms of Acquittances, Promiſſory Notes, Bills of Exchange, Letters of Advice, Letters of Credit, &c. all of which are adapted to ſuch Circumſtances as occur in real Buſineſs.

A GENERAL RECEIPT.

Received January 9, 1793, of Mr. James Jorden, the ſum of forty pounds in full, for one quarter's rent, due at Chriſtmas day laſt, and of all demands,

By me, **WALTER COLLINS.**

£40 0 0

A RECEIPT for ACQUITTANCE or RENT PAID.

Received this 12th day of January, 1793, of Mr. William Ward, the ſum of thirty-ſix pounds ten ſhillings in money, which, with nine pounds ſix ſhillings more, diſburſed by the ſaid William Ward, for taxes and reparations of the ſaid meſſuage and tenements he now occupies, ſituate in High-ſtreet, Birmingham, makes in the whole, the ſum of forty-five pounds ſixteen ſhillings, and is in full of half a year's rent, due to me out of the ſaid premiſes at Chriſtmas day laſt. I ſay received by me,

JOHN SLONE.

£45 16 0

A RECEIPT FOR INTEREST DUE ON BOND.

Received this 16th day of January, 1793, of Mr. Samuel Green, the ſum of five pounds, in full, for one year's intereſt of 100l. due to me at Chriſtmas laſt, on bond from the ſaid Samuel Green. I ſay received by me,

JOHN COPE.

£5 0 0

AN ACQUITTANCE FOR A LEGACY.

Received this 9th day of July, 1793, of Mr. John Cauſer, Executor of the laſt will and teſtament of Benjamin Bradley, late of Dudley, in the county of Stafford, deceaſed, the ſum of one hundred pounds, in full, of a legacy bequeathed to me, in and by the laſt will and teſtament of the ſaid Benjamin Bradley. I ſay received in full of all demands, by me,

WILLIAM PARKES.

£100 0 0

An Acquittance for the Purchaſe-Money on executing of a Conveyance, to be indorſed on the Back of the Deed.

Received the day and year within written, of the within-named William Hollins, the ſum of ſixty pounds, being the full conſideration money within-mentioned to be paid to me, I ſay received by me,

SAMUEL FALLOWS.

£60 0 0

The Form of Promiſſory Notes, or common Notes for Money.

The Form of one payable on Demand.

I promiſe to pay to Iſaac Watts, or Order, the ſum of Twenty Pounds, on Demand, for Value received; witneſs my Hand this firſt Day of July, 1793.

HENRY LOWE.

£20 0 0

The Form of one payable at a certain Time.

Birmingham, June 1, 1793.

Three months after date, I promiſe to pay to Mr. John Goodal, or Order, the ſum of Twelve Pounds, for value received by me,

W. T.

£12 0 0

Form of Inland Bills of Exchange.

Form of one payable at Sight.

£50 0 0 Birmingham, July 9, 1793.

At Sight pay Mr. Thomas Shirley, or Order, the ſum of Fifty Pounds, the value received of Mr. James Shirley, and place it to account, as per advice from

WM. SHIRLEY.

To Mr. John Pallett,
High-ſtreet, Worceſter.

Form of one payable after Date.

£50 0 0 London, July 4, 1793.

Two months after date pay Mr. John Cox, or Order, the ſum of Fifty Pounds ſterling, value in ourſelves, and place it without more advice to the account of

JOHN SHARP.

To Mr. Thomas Donn,
Moor-ſtreet, Birmingham.

Liverpool, July 15, 1793.

SIR,

Pay Mr. Thomas Phillips, or Bearer, One Hundred Pounds on demand, and place it to my account.

WILLIAM LARGE.

To Mr. John Hewett, Plater,
High Holborn, London.

Form of a Correſpondent's Letter of Advice.

Mr. John Day,
SIR, Dunkirk, Dec. 3, 1793.

By this poſt I have drawn on you for Three Hundred Crowns, at 34d. payable to yourſelf, value of Monſ. Edward Durient, which with my other Bills depending, pleaſe to honour, and the timely remittance ſhall be punctually made you by

Sir,
Your very humble Servant,
WALTER BROOKES.

To Mr. George Browne,
Merchant, Briſtol.

FORM OF LETTERS OF CREDIT.

SIR, Birmingham, July 22, 1793.

Pleaſe to furniſh the Bearer hereof, Mr. Thomas Wilkes, with the ſum of Two Hundred Pounds, as he ſhall require the ſame, and place it to my account, for which this Letter of Credit, with his Receipt, ſhall be your ſufficient voucher and warrant, giving upon payment a line or two of advice to

Your real Friend,
THO. GILL.

To Mr. Humphry Vaughton,
Merchant, Liverpool.

THE RECEIPT.

Received Augt. 24, 1792, of Mr. Humphry Vaughton, the ſum of Two Hundred Pounds, by virtue of Mr. Tho. Gill's Letter of Credit, of July 22 laſt, for the ſaid ſum.

THOMAS WILKES.

£20 0 0

FINIS.

$\frac{1}{4} = ,25$

$\frac{1}{2} = ,5$

$\frac{3}{4} = ,75$

Find a divisor by multiplying the square of the quotient by 3 —

To find the subtrahend —
Cube the last figure in the quotient
Multiply all the figures in the quotient by 3 except the last, & that product by the square of the last —
Multiply the divisor by the last figure —

1621 8456